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Division of

ORIGINAL

POLICY
RESEARCH
&
ANALYSIS

COMPLETED
350

SUMMARY
of
ACTIVE AWARDS
&
COMPLETED PROJECTS

Supplement 2

November 1981

Scientific, Technological, and International Affairs Directorate

National Science Foundation

Washington, D.C. 20550

SUMMARY
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ACTIVE AWARDS
&
COMPLETED PROJECTS

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Division of Policy Research & Analysis
Directorate for Scientific, Technological, and International Affairs
National Science Foundation
Washington, D.C. 20550

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I. INTRODUCTION

The Division of Policy Research and Analysis (PRA), established in early 1976, provides support for research and analysis of national and international issues related to science and technology. The activities of the Division are divided into three study areas: Environment, Energy, and Resources; Socioeconomic Effects of Science and Technology; and Technology Assessment and Risk Analysis.*

This volume serves as the second supplement to "Summary of Active Awards and Completed Projects" (NSF 78-1). NSF 78-1 provides bibliographic information on the active and completed extramural projects which were supported by PRA and its predecessor organizations, and for which final reports had been received through December 1977. Supplement 1 (NSF 80-3), dated December 1979, contains similar information about active awards and projects whose final reports were received between January 1978 and June 1979. Reports which were summarized in NSF 78-1 also appear in the Publications List of the supplements. (NOTE: Data herein were taken from program records and therefore may differ from official NSF source documents such as TAB A to the Budget and Part II of the Annual Report, which are generated from the Management Information System data base, and which may contain different inclusions/exclusions.)

This document represents an attempt to provide the policy and research communities with a cumulative summary of areas covered and the results of the research effort. It is hoped that it will contribute to the dissemination and use of the studies and their results and will lead to further development of science and technology policy research and analysis.

* The Innovation Processes and Their Management Group was transferred from the Division of Policy Research and Analysis to the Division of Industrial Science and Technological Innovation and became the Innovation Processes Research Section of that Division on March 8, 1981. Research projects supported by that group before the transfer are reported in this supplement.

II. INSTRUCTIONS FOR USE

This document is comprised of three sections--the project summaries, the indexes, and the publications list. Summaries are provided for each project (not for individual reports) using the following format:

********** Abstract # **********

Institution:

Principal Investigator/
Author:

Title:

Project Status:

Abstract:

Ordering Information:

Institution

A full mailing address is given for the main performing institution on each project. Institutions operating under a subcontract may or may not be included as a separate entry, depending on the size and type of contribution to the main project.

Principal Investigator/Author

Persons involved with the project or the project output are listed in the order found on the proposal or on the cover of the report. In some cases with multiple researchers or authors, the principal investigator has been identified. If no indication is given, the project director or principal investigator is the first name listed.

Title

The title is that of the project proposal, if an active award, or of the main final report resulting from the project. Titles of additional reports are indicated in the ordering information.

Project Status

The status of the project indicates whether the project is active or completed. If completed, the date of the final report(s) is given. In the case of active projects in which the reader has a particular interest, the postcards inside the back cover of this document allow the reader to request notification of the availablity of final reports.

Abstract

The abstracts are drawn from the proposal or from the final report(s), depending on the status of the project. In most cases, the abstract summarizes the problem being studied, the approach used, and the results of the study.

Ordering Information

Since the final project report(s) of all studies included in this volume are publicly available, information is provided for ordering or obtaining a copy. Most of the reports of completed projects have been or will be entered into the National Technical Information Service (NTIS) of the U.S. Department of Commerce at 5285 Port Royal Road, Springfield, Virginia 22151. The ordering number and the cost code are indicated for each report presently available. The current price list explaining these codes is reproduced on the next page. As indicated on the price list, a microfiche copy is also available for each publication.

Standard Price List for Documents Available from NTIS
(Prices current as of January 1981)

Price Code	Page Range	Price
A01	Microfiche	$ 3.50
A02	001-025	5.00
A03	026-050	6.50
A04	051-075	8.00
A05	076-100	9.50
A06	101-125	11.00
A07	126-150	12.50
A08	151-175	14.00
A09	176-200	15.50
A10	201-225	17.00
A11	226-250	18.50
A12	251-275	20.00
A13	276-300	21.50
A14	301-325	23.00
A15	326-350	24.50
A16	351-375	26.00
A17	376-400	27.50
A18	401-425	29.00
A19	426-450	30.50
A20	451-475	32.00
A21	476-500	33.50
A22	501-525	35.00
A23	526-550	36.50
A24	551-575	38.00
A25	576-600	39.50
A99	601-up	----*

* Contact NTIS for price quote.

The abstracts in the body of this volume are grouped into broad topic areas (e.g., Environmental Policy, Utilization of Technology Assessment and Risk Analysis). Within each broad category, the abstracts are ordered alphabetically by performing institution. In cases of multiple projects in the same category being performed by the same institution, further ordering is done alphabetically by principal investigator or first author last name.

Three indexes (Institution, Principal Investigator/Author, and Subject/Keyword) are provided for the use of the reader who has more specific topics in mind than those reflected by the broad categories, or who wishes to locate or identify studies performed by particular institutions or individuals. The indexes are cumulative, that is, they refer to abstracts in the original Summary document (NSF 78-1) as well as the Supplements. Abstracts appearing in this Supplement begin with the number 477.

The Publications List contains reports from completed projects whose findings were summarized in "Summary of Active Awards and Completed Projects" (January 1978, NSF 78-1) and "Summary of Active Awards and Completed Projects, Supplement 1" (December 1979, NSF 80-3). The following information is provided for each report:

Abstract Number

This refers to the completed project's abstract number as it appeared in the other documents. Each volume of a report is listed separately, therefore, some abstract numbers will be repeated several times.

Report Title and Publication Date

The title of the main final report and additional reports resulting from a project are provided with their respective dates of publication.

Performing Institution and First Author

The main performing institution of a project is provided along with the name of the first author as indicated on the cover of the report.

NTIS Accession Number and NTIS Cost Code or Other Source

Each report that is available from NTIS is assigned an accession number (the number beginning with PB-) and cost code. Reports that are not obtainable from NTIS refer to the names of other publication sources. The addresses of those sources are given on the next page.

ADDRESSES OF ADDITIONAL REPORT SOURCES

American Association for the
Advancement of Science (AAAS)
1776 Massachusetts Avenue, N.W.
Washington, DC 20036

American Physical Society (APS)
335 East 45th Street
New York, NY 10017

Annual Reviews, Inc.
4139 El Camino Way
Palo Alto, CA 94306

Bio-Energy Council
1337 Connecticut Avenue, N.W.
Suite 204
Washington, DC 20036

BDM Corporation
7915 Jones Branch Drive
McLean, VA 22102

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, DC 20006

Elsevier-Sequoia, S. A.
P.O. Box 851
1001 Lusanne 1
SWITZERLAND

Lexington Books
c/o D.C. Heath and Company
125 Spring Street
Lexington, MA 02173

McGraw-Hill Book Company
1221 Avenue of the Americas
New York, NY 10036

M.I.T. Press
28 Carleton Street
Cambridge, MA 02142

National Academy of Sciences (NAS)
Printing and Publishing Office
2101 Constitution Avenue, N.W.
Washington, DC 20418

Oelgeschlager, Gunn, & Hain
Publishers, Inc.
1278 Massachusetts Avenue
Cambridge, MA 02138

Pergamon Press
Maxwell House
Fairview Park
Elmsford, NY 10523

Praeger Publishers
383 Madison Ave
New York, NY 10017

Rutgers University Press
30 College Avenue
New Brunswick, NJ 08903

Sage Publications, Inc.
275 S. Beverly Drive
Beverly Hills, CA 90212

U.S. Government Printing
Office (GPO)
Division of Public Documents
Washington, DC 20402

University of Chicago Press
5801 Ellis Avenue
Chicago, IL 60637

Survey Research Centers
Institute for Social Research
University of Michigan
Ann Arbor, MI 48106

University of Oklahoma Press
Norman, OK 73069

Westview Press, Inc.
1898 Flatiron Court
Boulder, CO 80301

John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

For your convenience, listed above are complete addresses of report sources referenced on some pages of section III (Abstracts of Active Awards and Completed Projects), and section V (Publications List).

III. ABSTRACTS OF ACTIVE AWARDS AND COMPLETED PROJECTS

A. ENVIRONMENT, ENERGY, AND RESOURCES

1. Energy Research and Development

********** 477 **********

Institution: Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts 02140

Principal Investigator/
Author: Frederic March

Title: The Effect of Regulatory, Environmental, Energy and Economic Policies on Solar Investments by the Electric Utility Industries--A Test Case with Wind Power

Project Status: Active

Abstract:

This study will examine the impact of government policies in the electric utility area on the commercial applications of solar electric technology. A case study examination of utility scale wind energy systems forms the basis for the study. The research will build on previous work in utility systems modeling by General Electric, wind energy systems simulation studies by JBF, Michigan State University and the Aerospace Corporation, and Department of Energy (DOE)/National Aeronautics and Space Administration (NASA) R&D in large scale wind energy systems.

The approach of the research will be to (a) modify the General Electric synthetic utilities model to accommodate solar energy inputs, (b) document the characteristics of a typical windmill farm suitable for utility use (wind energy was chosen as the solar energy resource closest to commercial viability), (c) study relevant government policies through interviews with policy level personnel in executive and legislative agencies, and (d) interact with several U.S. electric utilities to determine and evaluate their constraints toward the acceptance of solar electric technology on a large scale.

This is a demonstration of a method to generate propositions about likely impacts of environmental and regulatory factors on the application of an intermittent resource such as solar (wind) technologies to the electric utility industries.

********** 478 **********

Institution: Carnegie-Mellon University
Schenley Park
Pittsburgh, Pennsylvania 15213

Principal Investigator/
Author: Edward S. Rubin
David R. Lincoln
George T. Duncan
Mark Kamlet

Title: Extension of Multi-Attribute Utility Theory to the Assessment of Environmental and Economic Tradeoffs in Regulatory Policies for Synthetic Fuel Processes

Project Status: Active

Abstract:

Environmental regulatory policy has traditionally focused on controlling emissions of single pollutants to a single environmental medium (air, water, or land) without rigorous analysis of the energy penalties and secondary environmental impacts that result. Under a current grant from the Division of Policy Research and Analysis, a multi-objective framework has been developed for environmental regulatory decisionmaking applicable to coal-fired utility and industrial boilers. An extension of this work is a proposal to develop and test improved methods for exploring the tradeoffs in alternate environmental standards and siting judgments as applied to coal liquefaction plants, which present a much more complex situation in terms of multi-media pollutant emissions and tradeoffs. The two principal components of the proposed project include the development of (1) quantitative models which systematically characterize selected technological systems and their multi-media environmental impacts; and (2) an improved human preference decision model, based on multi-attribute utility theory, for selecting optimum control and siting strategies incorporating multi-media environmental impacts and other concerns. Results of the proposed project are expected to bring new insights to the problems and potential for establishing environmental policies that more comprehensively reflect tradeoffs among energy, economic and environmental parameters.

********** 479 **********

Institution: Cornell University
New York State College of Agriculture and Life Sciences
Ithaca, New York 14853

Principal Investigator/Author: David Pimentel

Title: Biomass Energy Conversion: Ecological, Economic, and Social Constraints

Project Status: Completed (Report dated January 1977)

Abstract:

Development of substitute energy sources in lieu of non-renewable fossil fuels was addressed. The study was based on the projection that by the turn of the century almost half of the world's oil, gas, and coal resources will be consumed. In this study, an analysis was made of biomass energy conversion and its ecological, social, economic, and energy constraints. Estimates of the total biomass in the United States that could be utilized in energy production were presented. Biomass sources considered were feed processing wastes, crop remains, animal wastes, forestry wastes, fuel-wood production, brown-kelp farming, and water hyacinth. For the analysis, two methods were examined for converting biomass into useful forms of energy--incineration and biogas production. Results indicated that use of these methods could reduce the Nation's dependence upon fossil fuels by about five percent. Prime difficulties identified in the use of biomass for solar energy conversion were the (1) small percentage of light energy converted into biomass by plants; (2) low concentration of biomass per unit of land and water; and (3) high moisture content making collection and transport expensive and energy conversion inefficient. Suggestions were made to prevent harmful consequences to the environment from biomass conversion. Effects on the Nation's labor force and related social problems were considered.

Ordering Information: Available from NTIS.
Document: PB82-100546(A02)

********** 480 **********

Institution: Cornell University
Center for International Studies
Ithaca, New York 14350

Principal Investigator/
Author: Lawrence Scheinman

Title: Impediments to International Energy R&D Cooperation: A Political, Institutional and Legal Analysis

Project Status: Completed (Report dated May 1976)

Abstract:

The experience of advanced industrialized countries in cooperative ventures of research and development (R&D) was analyzed. Both energy-related and other technologies were examined to find conditions under which the most fruitful cooperation has taken place and to identify those legal and institutional factors which inhibit cooperation. Defined are: (1) international R&D problems and prospects; (2) trends in the formulation of energy R&D policy; and (3) Canadian-American energy R&D relations. Differences in needs and priorities of individual nations were considered as prime factors in determining energy policies and related R&D programs. The absence of energy policies, the free market, environmental conflict, the energy crisis, supply and demand, reserves, resources and production, conservation, patterns of energy R&D, and international cooperation were all studied. The research energy R&D dealt with relations between Canada and the United States, capital and technical constraints, transgovernmental and transnational relations, and domestic factors. The study concluded that pragmatic, incremental, and non-grandiose schemes for management of energy R&D relations are most likely to meet with success within the general advanced industrial state environment and also within the Canadian-American context.

Ordering Information: Will be available from NTIS.

********** 481 **********

Institution:	Cornell University Departments of Economics, and Civil and Environmental Engineering Ithaca, New York 14853
Principal Investigator/ Author:	Richard E. Schuler
Title:	An Analysis of Alternative Organizations of the Electric Utility Industry in the United States Under Evolving Technologies
Project Status:	Active

Abstract:

This project will investigate how the use of different technologies for generation, transmission, and distribution of electricity may allow more efficient alternatives to the existing structure or to the suggested consolidation of some utilities into even larger organizations for planning, financing, construction, and operation of new plants. The study will explore the technological, economic, and demographic conditions under which further consolidation would be desirable and those under which the reverse policy would be preferred. For example, the optimal fusion-electric facility could be large, which might argue for further consolidation, whereas the use of fuel cells as a source of commercial electricity might argue for separation and spatial competition among utilities. The application and extension of methodologies which relate the extent of scale economies in various technologies to the spatial density of demand will be used to assess the potential effects of energy-generation technologies on the efficiency of alternative institutional structures for the utility industry and, conversely, the effects of alternative structures on the development of the technologies.

********** 482 **********

Institution: Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Principal Investigator/
Author: Joyce M. Kelly

Title: Socio-Economic Impacts of Western Energy Resource Development

Project Status: Completed (Reports dated 1979)

Abstract:

The Denver Research Institute undertook for the President's Council on Environmental Quality, the Environmental Protection Agency, the Energy Research and Development Administration and the National Science Foundation an analysis of socio-economic impacts (of various options) for the development of western energy resources. The project concluded a three phase inter-agency study of western energy resource development. The contractors estimated the secondary impacts from oil shale development projects employing both input/output and economic base modeling methods to compare the results of the two major approaches. Additional tasks included the development and application of assessment methodologies for projecting the likely magnitude and seriousness of secondary effects and impacts to be expected from various types of energy development in the Western United States, and the options available at local, state and Federal levels for mitigating these effects and impacts. The study, together with the companion studies on environmental and economic impacts of western energy resource development, provided detailed information on various energy development scenarios under consideration.

Ordering Information: Available from NTIS .
Volume 1, Summary and Implications: PB80-185390(A03)
Volume 2, Assessment Methodologies: PB80-185408(A08)
Volume 3, Case Studies: PB80-185416(A16)
Volume 4, Computer Model: PB80-185424(A06)

********** 483 **********

Institution:	ECON, Incorporated 900 State Road Princeton, New Jersey 08540
Principal Investigator/ Author:	George A. Hazelrigg, Jr.
Title:	Preliminary Implementation of a Decision Analytic Management Instrument for Prioritizing and Evaluating R&D Alternatives for Complex Projects
Project Status:	Active

Abstract:

The objective of this study is to improve and implement a decision analytic methodology developed by the contractor for managing long term R&D projects to the level of practical demonstration. The software package of the decision analytic methodology, a "forward simulation" approach, will be modified in order to increase its computational efficiency and utility. Upon completion of the revisions of the computer code, the contractor will make the program available to the National Science Foundation (NSF) staff. The baseline program strategy and logic of the U.S. magnetic fusion program as compared to alternative strategies and logics will be the example R&D project analyzed. The results of this sample analysis will estimate the overall probability of achieving commercialization; the most probable successfully implemented reactor configuration and associated cost projection; and the sensitivity of these results to changes in policy implementations and shifts in probability estimates for successful subelements of the project.

********** 484 **********

Institution: ECON, Incorporated
900 State Road
Princeton, New Jersey 08540

Principal Investigator/
Author: George A. Hazelrigg, Jr.

Title: Lessons from the Development and Commercialization of Large-Scale Technologies Applied to Reactor Safety, Synfuels and Fusion

Project Status: Active

Abstract:

This study will examine the problems and issues of technology innovation in the past development of large-scale technologies such as light water reactors and communications satellites, where issues of research and development as well as demonstration were paramount. The lessons learned will be applied to three current R&D program areas encompassing widely different time scales: nuclear reactor safety, synthetic fuels, and fusion. The focus of this effort will be on identification and analysis of those factors which have contributed most significantly to successful (and in some cases unsuccessful) technology transfer to the private sector for the technology developed with public funds. Factors which will be examined include economic and technological motivations; economic and public safety risks; institutional arrangements affecting technology development and transfer; and the impact of amelioration of risk through the Federal sector of the R&D process, with particular emphasis on the research and development phases.

********** 485 **********

Institution: University of Illinois - Urbana
Energy Research Group
Urbana, Illinois 61801

Principal Investigator/
Author: Bruce M. Hannon

Title: Development and Test of a Method for Incremental Energy and Labor Impacts from Changes in Technology

Project Status: Active

Abstract:

The study will seek to relate changes in both energy consumption and the demand for labor to shifts in technology at the scale of individual industries. It will do this by calculating incremental changes in each of the products and services in each sector of the U.S. economy using a detailed 367 sector Input-Output (I/O) analysis. Inputs to the model will be based on Department of Commerce data for 1963, 1967, and 1972, the most recent year available. The study will create, validate, compare, and use in several applications a detailed set of incremental energy and labor impacts. Analysis of these impacts is useful to policymakers who wish to compare the impacts of alternate policy options involving dissimilar technologies. Examples are the new energy supply technologies (gasohol, solar powered satellites, and coal) versus conservation technologies (recycling scrap steel).

The research will build upon the author's previous work in average energy and labor impact analysis, in which the concept of "energy cost" of energy and labor is more fully developed. One benefit of the incremental analysis over the average energy analysis is that it reflects only those facilities which would actually be affected by specific policy decisions. The technique thus provides a sensitive predictor of consequences of given policies.

********** 486 **********

Institution: The MITRE Corporation
Metrec Division
1800 Dolley Madison Boulevard
McLean, Virginia 22102

Principal Investigator/
Author: Martin Neuworth

Title: Policy Implications of Providing Federal Subsidy for High Value Added Chemicals From Biomass

Project Status: Active

Abstract:

The National Energy Act "provides an exemption from the 4 cent Federal excise tax on gasoline for fuels containing a mixture of at least 10 percent alcohol, produced from agricultural products or waste." This policy provides a strong financial incentive to allocate significant biomass resources to the production of ethanol and methanol, and it is consistent with a current need in the United States to produce liquid fuels to displace imported petroleum.

An alternative use of biomass resources is to produce other oxygenated chemicals that exhibit a higher value added (HVA) than ethanol and methanol. Since these HVA chemicals are currently produced from petroleum feedstocks, their production from biomass resources would directly displace petroleum.

This project proposes to determine economic, technologic and market implications of an extension of current Federal policy to subsidize production of HVA chemicals from biomass resources. These issues are important to identify and determine in developing Federal policy for the allocation of extensive biomass resources. Data in support of such policy considerations will be developed for biomass resource availability and costs, conversion technology design, costs, and production characteristics, product production costs, markets for HVA chemicals, net energy balances, petroleum displacements, and Federal program costs.

The product of this effort will be useful to the development of Federal policies for the allocation of extensive biomass resources and as a contribution to the national goal of decreasing U.S. dependence on imported oil.

********** 487 **********

Institution:	State University of New York at Stony Brook Department of Applied Mathematics and Statistics Stony Brook, New York 11794
Principal Investigator/ Author:	Alan Tucker
Title:	Energy-Economy Model Linkage and Assessment
Project Status:	Active

Abstract:

Federal energy policies, regulations, and related basic research and development programs will ultimately affect the rate and direction of technological change and are among the major elements in the evolution of the U.S. energy system. Consequently, planning, analysis, and evaluation activities must be executed in sufficient detail to exhibit the effects of this technological change on the supply and end-use sides of the energy system and on the economic and environmental systems with which it interacts. The multi-dimensionality of the planning objectives governing choices among various policies and programs has necessitated the integration of detailed process/product-oriented energy and environmental systems models and traditional stock-flow economic models. This research will incorporate recent developments in systems modeling to develop and refine linkage strategies between and among the best available energy/economic system models, including end-use demand and sector models. The principal components of the proposed project include (1) an examination of integration strategies for two existing state-of-the-art energy/economy models to derive a more comprehensive modeling system; (2) an evaluation of alternative linkage strategies with respect to stability, convergence, and theoretical consistency; (3) to validate the linked system and test it on the recent price dislocations of OPEC; and (4) to document and disseminate the results of the model refinement and validation exercise. Results of the proposed project are expected to bring new insights to the problems and potential for establishing Federal scientific and technological policies that more comprehensively reflect tradeoffs among energy and economic parameters.

********** 488 **********

Institution: University of Pennsylvania
Moore School of Electrical Engineering
Department of Electrical Engineering and Science
Philadelphia, Pennsylvania 19104

Principal Investigator/
Author: Martin Wolf

Title: Review of the Economics of Photovoltaic Power Systems

Project Status: Completed (Report dated May 27, 1979)

Abstract:

The objective of this project was to review and evaluate the current state of knowledge regarding the economics of photovoltaic power systems and their components. In performing this evaluation, special attention was given to identifying the major factors which affect economic parameters, to identifying and evaluating fundamental limitations which might limit the potential for cost reduction, and to assessing the projected costs of photovoltaic power generating systems. The fundamental lower cost limits for many types of photovoltaic cells were found to be adequately low. However, there was some concern expressed about the ultimately achievable cost levels for the complete, operative systems.

Ordering Information: Available from NTIS.
Document: PB80-174386 (A07)

********** 489 **********

Institution: Rand Corporation
Santa Monica, California 90406

Principal Investigator/
Author: Deborah Hensler
Carl Hensler

Title: Voter Attitude and Choice on the California Nuclear Energy Initiative

Project Status: Completed (Reports dated July 1979)

Abstract:

A study on Californians' attitudes towards nuclear power and the nuclear energy initiative (Proposition 15) was made. This report was drafted before the accident at Three Mile Island and so did not address the question of the effects of the accident on public opinion. The study described public attitudes on the nuclear energy issue prior to the campaign. It explained the individuals' decision to vote for, against, or not at all on the proposition. Also, the study analyzed the effects of the campaign on public opinion. The implications of the California election for national reaction to the nuclear issue were discussed. The study found that through 1978, two-thirds of the general public supported continued nuclear development and accordingly voted against the proposition to limit it. Opposition to nuclear power plants resulted primarily from sober consideration of potential risks of continued development, particularly those risks associated with radioactive wastes. Concern about these risks was not confined to those who oppose continued nuclear development.

Ordering Information: Reports entitled "Evaluating Nuclear Power: Voter Choice on the California Nuclear Energy Initiative" are available from NTIS. Final Report: PB80-171358 (A08); Executive Summary: PB80-190564 (A02); Technical Appendix: PB80-190556 (A07)

********** 490 **********

Institution: Resources for the Future, Inc.
1755 Massachusetts Ave., N.W.
Washington, DC 20036

Principal Investigator/
Author: John J. Schanz, Jr.
James W. Sawyer, Jr.
Harry Perry

Title: The Optimal Regional Distribution of National Synthetic Fuel Capacity

Project Status: Completed (Report dated June 1979)

Abstract:

The purpose of this study was to examine the factors which have and will continue to influence plans for the eventual locations of future facilities to produce synthetic liquid and gaseous hydrocarbons from either coal or oil shale. The objective was to refine the analyses of where these plants are most likely to be placed regionally. The report examined previous case studies and analyzed technological constraints on power plant location. The locational decisionmaking process was looked at from the basis of four anticipated types of energy producing facilities: oil producing companies, interstate pipeline transmission companies, regional gas distributors, and energy consulting companies. Finally, two potential issues of the findings--forecasting and modeling of regional energy development, and policy-based decisionmaking--were addressed.

Ordering Information: Report entitled "The Future Regional Distribution of National Synthetic Fuel Capacity" is available from NTIS.
Document: PB80-170327 (A06).

A. ENVIRONMENT, ENERGY, AND RESOURCES

2. Environmental Policy

********** 491 **********

Institution: American Bar Association
1155 East 60th Street
Chicago, Illinois 60637

Principal Investigator/
Author: William A. Thomas

Title: Results of Scientist-Lawyer Cooperation Under the National Environmental Policy Act

Project Status: Active

Abstract:

Legal proceedings resulting from challenges to Environmental Impact Statements (EISs) prepared in compliance with the National Environmental Policy Act often require information that can only be obtained from expert witnesses. This study will assess the effectiveness of the legal process in obtaining scientific information necessary for these cases. Currently, expert testimony is obtained as responses to questions of an expert by attorneys who have hired that expert. Balance is provided by cross-examination and/or by testimony of the opposing attorney's experts. Such expert witness testimony becomes part of the information base for judicial decisions. This study will examine cases of scientist-lawyer courtroom exchanges in which interpretation of facts is at issue in the challenge to an EIS. An advisory committee will assess these exchanges, and the expert witnesses themselves will be asked to comment on any factors which they believe influenced the effective presentation of their expert opinions. The results of the research will be discussed at an annual meeting of the American Association for the Advancement of Science, in addition to publication in appropriate periodicals of the American Bar Association, the AAAS, and widely distributed periodicals.

********** 492 **********

Institution: Carnegie-Mellon University
Department of Engineering and Public Policy
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213

Principal Investigator/
Author: M. Granger Morgan

Title: Technological Uncertainty in Policy Analysis: Techniques for Estimating Health Impacts from Coal-Fired Power Plants

Project Status: Active

Abstract:

A large amount of uncertainty is inherent in society's attempts to understand the effects of air pollution and determine how much emissions ought to be abated. Much of this uncertainty is introduced through incomplete understanding of the physical, chemical, and biological processes involved. In the specific context of estimating the health impacts of sulfur air pollutants from coal-fired power plants, the principal investigator has developed a family of computer models which allows incorporation of this inherent uncertainty into the assessment process and exploration of its policy implications. This award supports research on five important additions to this earlier analysis: (1) extension of work on incorporating expert opinion and updating subjective distributions; (2) empirical examination of model robustness; (3) investigation of the value of information and the marginal benefits of research investment; (4) extension of results to geographical regions other than the upper Ohio River basin; and (5) examination of the problems of dealing with long-range transport.

********** 493 **********

Institution: Carnegie-Mellon University
Department of Energy and Environmental Studies
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213

Principal Investigator/Author: Edward S. Rubin

Title: Application of Multiattribute Utility Theory to the Assessment of Environmental Regulatory Policy

Project Status: Active

Abstract:

Environmental regulatory policy has traditionally focused on controlling emissions of single pollutants to a single environmental medium (air, water or land) without additional analysis of the energy penalties and secondary environmental impacts that result. While the U.S. Environmental Protection Agency and others acknowledge that a multimedia approach to regulations may have significant economic and environmental benefits, a framework for such an approach remains to be developed. This research will develop and test improved methods to overcome these impediments to the components of the proposed project including development of (1) quantitative models which systematically characterize selected technological systems and their multimedia environmental impacts under alternative regulatory strategies, and (2) a human preference decision model, based on multiattribute utility theory, for facilitating comparisons among alternative control strategies based on multimedia environmental impacts and other concerns. The research methodology will be applied to two environmental policy issues of current interest: standards for coal-fired power plants and standards for industrial boilers. Results of the proposed project are expected to bring new insights to the problems and potential for establishing environmental policies that more comprehensively reflect tradeoffs among energy, economic and environmental parameters.

********** 494 **********

Institution:	Columbia University School of Public Health Division of Environmental Sciences New York, New York 10032
Principal Investigator/ Author:	Granville H. Sewell
Title:	The Quality of Scientific Considerations in Decisions Affecting the Environment
Project Status:	Active

Abstract:

The study is examining the substantive quality of environmental impact statements (EISs) to determine their usefulness in supporting and influencing decisionmaking. The research builds upon previous work, including studies by the Council on Environmental Quality and the Institute of Ecology.

The approach of the research is to (1) study 20 or more EISs that recently underwent litigation; (2) classify the basis of decisions in these cases as being either substantive, procedural, or indeterminate (nonclassifiable); and (3) evaluate the quality of scientific analysis as applied in the key sections of the EISs. To the extent feasible, an attempt is being made to compare estimated environmental impacts as described in each EIS with actual impacts as observed after the action has been taken.

The research will provide: (1) clarification of the case for improved administrative EIS review prior to judicial review, and (2) facilitation of the selection of future research projects by NSF and other agencies that are studying the EIS process, particularly science-quality issues appropriate for NSF concern.

********** 495 **********

Institution: Cornell University
Program of Science, Technology, and Society
Ithaca, New York 14853

Principal Investigator/
Author: Ronald J. Brickman

Title: A Cross-National Analysis of Public Policies Concerning Carcinogens and the Chemical Industry

Project Status: Active

Abstract:

The study involves a comparative analysis of governmental policies (operating in the United States, the United Kingdom, and France) relative to the regulation of carcinogens. Differences in regulatory philosophies and strategies and in procedural details of policy implementation between the countries have been identified as major factors in policy formation.

The researchers are identifying the nature and magnitude of these differences with respect to: (1) legal-institutional and political bases for policy formation and implementation; (2) the utilization of scientific information in the decision process; and (3) the strategy of economic development (relative to the chemical industry) in each nation.

The study is designed to identify and validate methodologies for studying comparative environmental policy and to demonstrate which policy instruments are available for carcinogen control. Using the comparative methods, the study endeavors to clarify the relationship between public policy, scientific knowledge, and technological change.

********** 496 **********

Institution:

Cornell University
Department of Environmental Engineering
and Center for Environmental Research
123 Day Hall
Ithaca, New York 14853

Principal Investigator/Author: Mitchell J. Lavine

Title: Use of Embodied Energy Values in the Analysis of Energy/Environmental Trade-Off Decisions: An Exploratory Analysis

Project Status: Active

Abstract:

Decisionmaking problems often arise when issues occur at the environment/energy/economic interface and lack a metric common to economic and natural systems. Such a lack disallows objective, quantified evaluations of environmental/economic trade-offs. Energy analysis (EA) tools have the potential for ameliorating this problem. However, a component of the theoretical foundations of EA is unverified for its utility in environmental decisionmaking; that is, validation of the hypothesis that there exists a consistent relationship between total economic value (of goods and services produced either by human or by natural systems) and the energy cost inherent in achieving that value (the metric would be energy embodied in the good or service or its dollar equivalent). The subject research would: (1) critically review and synthesize information on existing EA theory and its applications; (2) test the fundamental hypothesis in two distinct ways; and (3) detail valid applications and the limitations of EA as well as illustrating an appropriate energy analysis procedure for environmental impact assessment. Using such methods, environmental policy decisions could be made within a perspective that allows direct comparison of environmental factors with other Federal policy factors commonly evaluated in dollar terms.

********** 497 **********

Institution:	Cornell University Ithaca, New York 14853
Principal Investigator/ Author:	David Pimentel
Title:	Assessment of the Scientific and Technological Information Base for Decisions on Management of Pests Using Non-Chemical Controls
Project Status:	Active

Abstract:

The project will evaluate integrated pest management (IPM), a technology which has gained wide-ranging support within the Federal Government. The United States Department of Agriculture (USDA), United States Environmental Protection Agency (USEPA) and the Council on Environmental Quality (CEQ) have encouraged use of IPM methods in anticipation of measurable economic benefits (increased agricultural, silvicultural and domestic animal production) and maintenance of environmental quality (i.e., obviating some uses of potentially hazardous or toxic pesticides). The project is designed to disclose the state-of-the-art of currently employed IPM techniques and to aid assessment of the recognizable environmental and health risks of available biological and cultural pest controls. Demonstration of the inherent risks early on in the development of policies supporting IPM will aid in the utilization of sound pest control strategies and help to establish a more comprehensive and enlightened agricultural policy for the Nation. The work will constitute an information survey supplemented by expert contact. Final output of the project will be subjected to intensive review by IPM practitioners and will be disseminated to U.S. Government agencies, state governments and agricultural experiment facilities as an aid to the agricultural decisionmaking process.

********** 498 **********

Institution:	University of Illinois at Urbana-Champaign Department of Civil Engineering and Institute for Environmental Studies Urbana, Illinois 61801
Principal Investigator/ Author:	J. Wayland Eheart E. Downey Brill, Jr.
Title:	Methods for Evaluation and Assessment of Transferable Discharge Permits for Control of Biochemical Oxygen Demand
Project Status:	Active

Abstract:

Under a policy of Transferable Discharge Permits (TDPs, also known as pollution rights or marketable effluent permits), the right to discharge a certain quantity of pollutant, once issued by the government authority, may be transferred among dischargers as a free-market commodity. The total quantity of permits extant is controlled by the governing authority, which may issue more or recall some, as the need is perceived. A TDP system insures that environmental protection is maintained while permitting existing facilities to grow and allowing new facilities to be established.

Although a marketable permit system is relatively easy to devise for conservative pollutants under certain conditions, a satisfactory system is far more difficult to construct when the pollutant under consideration is nonconservative and/or the desired water quality varies by location. Such a system must recognize that the location of discharges may change as permits are transferred, and must take account of the chemical and physical properties of wastewater effluents and the receiving body, as well as the technological capabilities of the dischargers.

The specific research objectives are: (1) to postulate several systems of TDPs for control of biochemical oxygen demand; (2) to evaluate each system for cost efficiency, equity, ease of implementation and administration, incentives for technological innovation, water quality impacts, and certainty of outcome; and (3) to summarize project results to provide information useful to Federal policymakers in evaluating candidate TDP systems.

********** 499 **********

Institution:	Indiana University Foundation 355 Lansing Street Indianapolis, Indiana 46202
Principal Investigator/ Author:	Lynton K. Caldwell
Title:	A Study of Ways to Improve the Scientific Content and Methodology of Environmental Impact Analysis
Project Status:	Active

Abstract:

The study focuses on the adequacy of scientific inputs to the decision processes of Federal agencies and addresses how the scientific content of environmental impact statements can be made more useful to policymakers and increase the validity and reliability of environmental decisions.

The approach includes critical reviews of the substance and methods of environmental impact analyses, and their effect upon policy decisions. It seeks to identify substantive areas in which more effective input of scientific information can result in more effective and defensible policymaking. Attention will be given to better methods for ascertaining thresholds of significance, i.e., indications of need for further scientific inquiry along with the level, scope, and probable duration of the investigations that are indicated.

Study objectives are: (1) to find more effective ways of building science into the environmental policy process by (2) comparing the efficacy of principal analytic methods presently in use, and (3) ascertaining possible new methods and combinations of methods to strengthen the validity and reliability of environmental decisions.

********** 500 **********

Institution:	Institute on Man and Science Rensselaerville, New York 12147
Principal Investigator/ Author:	Gordon A. Enk
Title:	Pollution-Induced Disease: An Assessment of the Scientific Knowledge Base Related to the Victim Compensation Issue
Project Status:	Active

Abstract:

The project is designed to assess the adequacy of scientific knowledge about the relationship between exposure to toxic substances and the induction of disease for decisions on the issue of victim compensation. Guided by a strategy committee (to include experts in human health research, Federal decision-makers representing agencies which may have a role in compensation programs, and representatives of public interest groups and the private sector), the project will provide a systematic investigation of the problems of, and the progress needed in, determining the etiology of pollutant-induced disease. The first phase of the project will involve a literature review supplemented by intensive contact with experts in environmental toxicology and Federal decisionmakers to establish the status of current knowledge in this area. The second phase will involve conduct of two Scientists' Forums to explore the science and technology policy dimensions of compensation programs. Commissioned papers (five within each Forum) will provide indication of the scientific and policy background information necessary for development and implementation of compensation programs. The final phase concentrates on timely dissemination of the findings and recommendations gathered during Phases I and II.

********** 501 **********

Institution:	Institute on Man and Science Economic and Environmental Studies Rensselaerville, New York 12147
Principal Investigator/ Author:	Gordon A. Enk Stuart L. Hart
Title:	Assessment of Methodologies for Enhancing the Scientific Content and Utility of Environmental Impact Statements
Project Status:	Active

Abstract:

The research objective of this study is to identify and to recommend methods which will increase the utility of environmental impact statements (EISs) to the Federal decisionmaking process. A central feature of the project is a workshop to take place in Rensselaerville, New York. The project (and workshop) is expected to improve communication among those responsible for the conduct of environmental impact assessments and the interpretation of EISs.

The approach of the project involves conducting a literature review and contacting leading experts to identify tested, yet innovative, procedures which enhance the use of scientific and technological analyses of the EIS process. The project will address the substantive aspects of EIS preparation rather then administrative and procedural aspects. Identifying methods which enhance the transferability of information used in EIS preparation between Federal and state/local agencies is a stated goal of the project.

The project is designed to identify and evaluate effective methods of incorporating science into the environmental policy process. By comparing the efficacy of analytic methods currently in use for the development of EISs with new methods, the project will strengthen the validity of environmental decisionmaking.

The products of the conference will include interpretive reports, a proceedings volume, and an executive summary.

********** 502 **********

Institution: Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Principal Investigator/
Author: James A. Fay

Title: Regional Air Quality: The Technical Basis for Policy Alternatives

Project Status: Completed (February 1977)

Abstract:

This research was concerned with the use of a simple meteorological model to relate ambient air quality with emissions of air pollutants from sources within very large regions (of the order of 1000 km or greater in size) for the purposes of ascertaining the necessity (or not) of considering pollution abatement programs on a regional, rather than statewide basis. A simple linear analytic model for long distance transport and dispersion from a point source was developed. The model accounts for depletion of pollutants and conversion of primary to secondary pollutants, both as first order processes. Also, an approximate model for secondary pollutant transport and dispersion was derived. Results from the use of this model for determining average ambient levels of pollutant emitted from a point source were found to compare favorably with calculations made according to a more sophisticated meteorological trajectory model. As an illustrative example of the usefulness of this model for studying regional air pollution control strategies, the annual average ambient levels of sulfur dioxide and sulfate in the continental United States resulting from emissions from all U.S. fossil fuel power plants were determined. Also, sulfate levels were computed and compared with measured values at several hundred locations. However, considerable further comparisons are needed, before practical use can be made of this model for control purposes.

Ordering Information: Published in Atmospheric Environment, Volume 14, Number 3, 1980.

********** 503 **********

Institution: Oros Company
1616 Arlington Drive
Salt Lake City, Utah 84103

Principal Investigator/
Author: Noel de Nevers

Title: An Air Quality Approach to Natural Gas Curtailment

Prlject Status: Active

Abstract:

By modifying our natural-gas pipeline dispatching procedures, we can achieve reduced air-pollution levels using our current fuel mix or maintain present air-pollution levels using a fuel mix which relies more heavily on coal than is possible with our current natural gas pipeline dispatching procedures. This proposed change is one which envisages distributing natural gas to interruptible users on a daily-pollutant-dispersion basis rather than the bases now used.

The concept has been subjected to a computer simulation under very strong simplifying assumptions. That simulation showed that the predicted air quality improvement would occur if the modified dispatching procedure was used.

It is proposed to extend the previous study of the concept by relaxing as many of these strong simplifying assumptions as possible, by making as realistic assumptions as possible and by using as much historical data as possible. A dispatching algorithm will be produced and tested in real time for an actual pipeline.

********** 504 **********

Institution: Southeastern Louisiana University
College of Business
Hammond, Louisiana 70402

Principal Investigator/
Author: Joe C. Iverstine

Title: The Impact of Environmental Protection Regulations on Research and Development in the Industrial Chemical Industry

Project Status: Completed (Report dated June 1978)

Abstract:

As a result of the implementation of environmental protection regulations, operations of chemical firms have been significantly affected. This project investigated the impact of these regulations on R&D in the chemical industry. The researchers investigated the following areas: (1) the manner in which environmental protection regulations have changed or influenced traditional R&D activity; (2) the effect of these changes; and (3) an examination of the underlying bases for these changes. Primary data were collected by personal interviews at 15 major R&D centers of firms which conducted 71 percent of chemical R&D. Major findings were: (1) Approximately 13.5 percent of chemical R&D is allocated to environmental protection projects. This resulted in an outlay of $198.7 million in 1976. R&D spending was not increased to offset this outlay because chemical R&D is at the 1967 level in terms of constant dollars. R&D to sales ratio actually declined in 1976. Hence, there has been a curtailment in traditional R&D projects. (2) Research to solve environmental protection projects has been effective as assessed by compliance with regulations. (3) Numerous new products have been screened out because of potential environmental considerations. (4) The impact on R&D has been uniform across the industry.

Ordering Information: Available from NTIS.
Final Report: PB80-174337 (A07)
Executive Summary: PB80-174329 (A02)

********** 505 **********

Institution:

Southeastern Louisiana University
Department of Business Administration
P.O. Box 851
Hammond, Louisiana 70402

Principal Investigator/
Author:

Joe C. Iverstine

Title:

Technological Response to Environmental Protection Regulations and Energy Price/Supply Structure: A Case Study of Chlorine/Caustic Soda Manufacturing

Project Status:

Active

Abstract:

Recent innovative activity in chlorine/caustic soda manufacturing has apparently been in reponse to environmental protection regulations and changes in the price/supply structure of energy, as evidenced by severe pollution problems (mercury, lead, asbestos) and the energy intensity (60 percent of manufacturing cost) characteristics of the industry. This case study, of an industry with discernible tradeoffs between environmental and energy goals in alternative technologies, will analyze available secondary data on chlorine/caustic soda technology from 1900 to the present. Primary data on the present state of technological response will be obtained via personal interviews of all 31 chlorine/caustic soda producers in the United States.

Results of the case study will provide information useful to Federal decisionmakers in predicting the ability of technology to adapt to energy and environmental issues. This information is timely since energy-intensive industries will be the first to experience the impact of changing energy supplies. In addition, the ability of firms within the industry to use technology to moderate adverse effects will be reflected in future price/supply of their products. Therefore, a wide range of end-users will be directly affected.

A. ENVIRONMENT, ENERGY, AND RESOURCES

3. Water Quality

********* [illegible]6 **********

Institution: Colorado State University
Department of Agricultural and Chemical Engineering
Fort Collins, Colorado 80523

Principal Investigator/Author: Robert C. Ward

Title: Criteria and Methods for Relating Stream Standards to Water Quality Monitoring Practices

Project Status: Active

Abstract:

Federally formulated water quality criteria are used by states in establishing mandated stream standards. The criteria are based on beneficial uses to which stream water may be put. Data used by states to check compliance of streams with their standards must be expressed in statistical terms. Criteria based on beneficial use are normally expressed as constituent limits not to be exceeded. Differences in the criteria, resulting standards, and monitoring data make data interpretation relative to standard compliance very difficult.

The project will review three states' water quality standards to determine the data actually needed to check compliance in a statistically sound manner; statistically characterize the states' data records to establish the type of statistics current monitoring can supply; and then formulate statistically oriented criteria. Formulations will be derived after reviewing existing applications for statistical criteria in infrequent but severe floods, industrial quality control, and effluent standards.

The approaches for incorporating monitoring statistics into water quality criteria and standards will be rated as to the ability of the statistics used to actually detect compliance or noncompliance (i.e., power of the statistical test). Finally, recommended statistical monitoring criteria will be proposed.

********** 507 **********

Institution: The John Muir Institute
743 Wilson Street
Napa, California 94558

Principal Investigator/Author: Gary D. Weatherford

Title: Western Water Institutions in a Changing Environment

Project Status: Active

Abstract:

This study will assess the responses of existing water resources management institutions in the West to water reallocation problems associated with increased conservation in agriculture. It will (1) describe a policy system that explains water management decisionmaking as it relates to the allocation of water to and from irrigated agriculture in the West; (2) conduct four case studies focusing, respectively, on the reallocation of new water in the Central Arizona Project, the institutional dynamics behind the conservation of agricultural water in parts of the Tulare Basin in California, the response of Navajo tribal institutions to water allocation changes in the Navajo Indian Irrigation Project, and a comparison of water right transfer procedures in western jurisdictions; and (3) recommend feasible institutional approaches to agricultural water conservation and reallocation.

A. ENVIRONMENT, ENERGY, AND RESOURCES

4. Resources

********** 508 **********

Institution: American Society of Mechanical Engineers
345 East 47th Street
New York, New York 10017

Principle Investigator/ Author: Bernard Fishman

Title: The Impacts of Materials Substitution on Energy Conservation, Environmental Goals, and Resources Recycling

Project Status: Active

Abstract:

The study will define the problems of recyclability and secondary impacts likely to occur as a result of the substitution of lightweight materials in the manufacture of future U.S. automobiles and identify R&D initiatives that can lead to new or improved technologies for processing new materials.

While it is uncertain what the precise composition of these substitute materials will be, it is anticipated that they could produce significant impacts on current recycling technologies, resulting in changes in the price of scrap and processing costs, increased demand for virgin metals, and increased disposal problems for unsalable or environmentally hazardous materials.

The Energy Policy and Conservation Act of 1975 requires that average fleet fuel consumption be reduced by almost half, moving from a 14mpg average in the early 1970s to an average rate of 27.5mpg by 1985. It is estimated that the average weight of American automobiles will have to be reduced from over 4,000 lbs, to about 3,000 lbs., and that the reduction will require significant increases in the use of new high-strength steels, new alloys of aluminum, and new types of plastics and reinforced composites.

The study will define the probable impacts of the shift to substitute materials on the domestic scrap industry and its foreign trading partners, and identify promising areas for R&D in developing new and improved technologies and processing methods for handling substitute materials. The study will improve the data base for S&T decisions affecting materials and benefit decisionmakers who must decide on tradeoff questions involving energy conservation requirements, environmental goals, and resources availability.

********** 509 **********

Institution: Cornell University
Aerospace Engineering
Ithaca, New York 14850

Principal Investigator/
Author: Peter L. Auer

Title: Uranium Fuel Requirements Study

Project Status: Completed (1976)

Abstract:

A simple simulation model was used to compute the system-wide feed and isotope enrichment requirements of an expanding nuclear economy. A number of growth rates were used to estimate future nuclear generating capacity to the year 2030. Advanced reactors consisting of either the IMFBR or a high conversion ratio reactor operating on the thorium fuel cycle were introduced at various possible starting dates into the system, which initially consisted of LWRs.

Ordering Information: Article entitled "System Wide Uranium Feed and Separative Work Conservation Available with Advanced Reactors," published in Annals of Nuclear Energy, Volume 4, pp 27-36, Pergamon Press, 1977.

********** 510 **********

Institution:	Council on Environmental Quality 722 Jackson Place, N.W. Washington, DC 20006
Principal Investigator/ Author:	Gerald O. Barney
Title:	Partial Support for the "Global 2000" Study
Project Status:	Completed (Reports dated 1980 and 1981)

Abstract:

President Carter directed the Council on Environmental Quality (CEQ)and the Department of State, working in cooperation with the Environmental Protection Agency, the National Science Foundation, the National Oceanic and Atmospheric Administration, and other appropriate agencies to make a one-year study of the probable changes in the world's population, natural resources and environment through the end of the century. The study was to serve as the foundation of the government's longer-term planning. To answer the President's directive, the study drew upon existing models and projection tools, giving first priority to capabilities within the government. While most projection and modeling capabilities previously available were restricted to relatively narrow disciplines or subjects, the study drew these single-purpose projections together as consistently as possible into an integrated whole. The results of this process were compared with those of large-scale systems-models such as that developed by Professor Mihajlo Mesarovic at Case Western Reserve University. A number of these large systems-models were analyzed as possible approaches to the kind of integrated analyses required for longer-range planning. The study identified scarcities and problems which may become serious by 2000 and the years following the turn of the century, to the extent that these could be identified in this brief analysis. The NSF joined the Department of State, CEQ, Central Intelligence Agency (CIA), National Aeronautics and Space Administration (NASA), and the Office of Science and Technology Policy (OSTP) in support of this study.

Ordering Information: Reports entitled "Global 2000, Report to the President: Entering the 21st Century" are available from U.S. GPO.
Volume 1, Summary, Order Number: 041-011-000378, $3.75
Volume 2, Technical Report, Order Number: 041-011-000386, $13.00
Volume 3, Order Number: 041-011-000513, $8.00

********** 511 **********

Institution:	The Pennsylvania State University College of Earth and Mineral Sciences University Park Campus University Park, Pennsylvania 16802
Principal Investigator/ Author:	W. A. Vogely
Title:	Evaluation of and Alternatives to the Policy Process for Materials in the United States
Project Status:	Active

Abstract:

The research is to develop criteria by which the policy process for materials (specifically nonfuel minerals) in the United States can be evaluated with respect to its effectiveness and efficiency. These criteria will then be applied to the current policy process system for materials policy in the United States and, for comparison purposes, in Australia. Based upon these two case studies, a set of alternative policy processes in the United States will be designed and evaluated by the criteria.

The research will result in two interim reports and a final report. The first interim report will cover the criteria and the evaluation systems connected thereto, and a description and evaluation of the policy process within the United States. The second interim report will contain a description of the policy process in Australia and evaluation of that process by the same criteria. The final report will summarize the two interim reports and will present alternative processes for the United States. These reports can have very important implications for the United States Government and society. Materials policy has been the subject of many major studies, including three very high level studies in the 1970s. Yet there has been no resolution of the issues raised by these studies, and the question of materials policy remains an open one. This research, by addressing itself to the policy process rather than the policy issues, should enable the government to make a rational and reasoned choice as to the mechanisms by which materials issues will be raised for political decision and to establish a continuing effective mechanism whereby these policy issues can be handled on a continuing basis.

********** 512 **********

Institution:	SRI International 333 Ravenswood Avenue Menlo Park, California 94025
Principal Investigator/ Author:	William B. Beatty
Title:	The Impact of Regulatory Policies, Resources Depletion, and Foreign Competition on Nonfuel Minerals Exploration in the United States
Project Status:	Active

Abstract:

The Problem Analysis phase of the Domestic Policy Review of Nonfuel Minerals Policy demonstrated that available scientific and technical data were inadequate or inadequately validated to support conclusions on whether private sector exploration activities were sufficient to maintain U.S. reserves, production capacities, and inventories of nonfuel minerals in the event of possible supply/price disruptions.

This study will attempt to define, quantify, and improve the data base for S&T decisionmaking in the nonfuel minerals area. The study will examine several factors believed to be responsible for the decline in domestic minerals exploration and production over the past decade and assess the effects of this decline, if continued, on the future competitive position of the domestic nonfuel minerals industry.

The investigators will compile what data are available pertaining to exploration costs and effort versus minerals production over the past ten years and, through a series of interviews with industry officials, assess the effects of regulatory policies, resources depletion, and foreign competition on the decline in exploration and production and the extent to which those factors influenced company decisions. The study team will then develop a series of options for improving exploration efficiencies and effort and analyze their potential impact on current Federal policies affecting nonfuel minerals exploration and development.

B. INNOVATION PROCESSES AND THEIR MANAGEMENT

1. Private Sector Innovation Processes

********** 513 **********

Institution: Carnegie-Mellon University
School of Urban and Public Affairs
Pittsburgh, Pennsylvania 15213

Principal Investigator/
Author: Otto Davis
George Burman
Robert Green

Title: The Regulatory Decision Process and Its Consequences for Market Innovation

Project Status: Completed (Report dated November 1979)

Abstract:

This project examined the regulatory ratemaking process of the Pennsylvania Public Utility Commission (PUC). The report provides a model describing the internal processes of the agency in response to changes in technology, market structure, and social and political environments. The model was tested and used to explain the PUC's treatment of two transportation innovations: paratransit and computer-based taxicab fare calculation.

Ordering Information: Available from NTIS.
Document: PB81-220154 (A05)

********** 514 **********

Institution:	Case Western Reserve University Cleveland, Ohio 44106
Principal Investigator/ Author:	Bela Gold
Title:	Technological Innovations and the International Competitiveness of U. S. Manufacturing Industries
Project Status:	Active

Abstract:

This project has two major objectives: (1) to develop a comprehensive, operationalized definition of international technological competitiveness of manufacturing firms, and (2) to identify factors related to competitiveness, across a range of industries. Accomplishment of these objectives will improve the diagnostic underpinning of Federal policies designed to accelerate productivity and to improve the technological capabilities of U.S. firms.

This project will focus on five U. S. industries (or products groups) representing varying levels and patterns of international competitiveness. Economic, technological, and other factors entering into firms' decisions on international trade will be identified through interviews with producers, distributors, importers, exporters, customers, government officials, and academic experts. From the data, conceptual framework, and methodologies resulting from this project, future research on successively broader samples of industries in the United States and their counterparts abroad can be structured.

The duration of this project is 12 months, with the final report expected September 1, 1980.

********** 515 **********

Institution:	University of Cincinnati Department of Quantitative Analysis Cincinnati, Ohio 45221
Principal Investigator/ Author:	Norman R. Baker
Title:	A Multivariate Analysis of Industrial R&D Projects and Its Implications for Policy Analysis and Management
Project Status:	Active

Abstract:

This study is a secondary analysis of two existing data bases previously subjected to univariate analysis. The purpose is to use multivariate statistical techniques to identify stable relationships termed "generic project classes," which utilize research, development and engineering (RD&E) projects within industrial settings as the unit of analysis. Specific research tasks are to (1) develop data coding and collection instruments, (2) define specific multivariate hypotheses, and (3) employ factor and cluster analyses and other multivariate methods to refine these hypotheses. The variable domains to be analyzed include (1) the external economic environment of the firm, (2) organizational structures and processes, (3) the characteristics of RD&E projects, and (4) the characteristics of the product or process being addressed by a RD&E project. Ultimately this study may enhance the conceptual coherence and empirical integration of the field of innovation process research in industry. For Federal policy, conceptual coherence and integration of industrial innovation process research could allow more precise targeting of policies aimed at stimulating private sector RD&E and more complete understanding of the possible consequences of policies aimed at other industry activities on the RD&E function.

The project will take fourteen (14) months, with the final report due on May 15, 1981.

********** 516 **********

Institution:	DePaul University Department of Management 25 East Jackson Boulevard Chicago, Illinois 60604
Principal Investigator/ Author:	John E. Ettlie
Title:	A Longtitudinal Study of Technological Innovation in the Food Processing Sector
Project Status:	Active

Abstract:

This study will investigate two related product innovations, the retortable pouch and retortable steam tray, and their accompanying process innovations in two vertically related industries, food processing equipment manufacturing and food processing. The retortable pouch (and tray) is made of three layers of plastic and aluminum foil. It is light and yields satisfactory long term storage of foods without spoilage inhibitors or refrigeration. It is a substitute for tin cans and frozen foods, possessing certain advantages (as well as disadvantages) over them.

The project team will undertake a cross sectional indepth analysis of the diffusion of these innovations using a stratified sample of 300-400 firms, as well as a retrospective analysis of the process up to the present time. This analysis represents the first half of a "real-time" longitudinal analysis that would be accomplished by the funding of a follow-up study three to four years from now to analyze a second cross-section of firms. The primary goal of this study is to determine the important predictors of innovation adoption at the level of the firm. It will consider variables representing (or influencing) technological and business capabilities, profitability forecasts, and Federal Government incentives (R&D and procurement contracts) and inhibitors (Food and Drug Administration regulations).

This study represents a good opportunity to study an innovation in its early stage of diffusion, when the innovation is likely to diffuse much more extensively over the next decade. It is also an excellent setting for concentrating on the influence and interaction of private and government factors on innovation decision making in private firms.

********** 517 **********

Institution:	University of Maryland College of Business and Management College Park, Maryland 20742
Principal Investigator/ Author:	Richard Kolodny Bertrand Horwitz
Title:	The Economic Effects of Uniformity in the Financial Reporting of Research and Development Expenditure
Project Status:	Completed (Report dated March 1980)

Abstract:

This study examined the effects on small business R&D outlays and on management attitudes towards R&D of the regulation (recommended by the Financial Accounting Standards Board) to employ the expense-only method in disclosing all R&D outlays to their stockholders and the general public. In their annual reports prior to the adoption of Rule 2 by the Securities and Exchange Commission (SEC) in October 1975, small firms tended to defer outlays and amortize them over future years, treating R&D as long term investment. The R&D decisions of a sample of 43 firms that preferred the deferral method of reporting prior to 1975 were contrasted with a comparison group of firms matched on selected financial variables. Based on (1) statistical tests run on the association between the timing of SEC Rule 2 and the changes in levels of R&D, and (2)questionnaire responses of chief operating officers of the sampled small firms, the investigators conclude that for small, high technology firms forced to change their accounting methods, the SEC disclosure ruling caused a relative decline in levels of R&D outlays. These results suggest the special need to evaluate the consequences for small firms of involuntary uniformity in reporting R&D outlays.

Ordering Information: Will be available from NTIS.

********** 518 **********

Institution: University of Maryland
Department of Economics
College Park, Maryland 20742

Principal Investigator/ Author: Mancur Olson

Title: The Political Economy of Innovation and Growth

Project Status: Active

Abstract:

This study will test a major new model or theory intended to explain some of the major variations in the rate of innovation and of economic growth in different developed countries and in different regions of the United States. The model relates periods of political stability to the growth and increasing specialization of common interest groups. It connects their growth and increasing specialization to innovation-retarding activities. The principal investigator proposes to further develop and test this model and elaborate its implications for public policy, especially policy concerning R&D and innovation. The model is consistent with easily available evidence, but this evidence is not sufficient to confirm its validity or establish the strength of the linkages between major variables. The many implications of the model will be tested by detailed investigation in different states and industries in the United States and in various foreign countries. If the model should be substantially correct, then it would have many implications for public policy, especially policy concerned with technological innovation.

********** 519 **********

Institution:	Massachusetts Institute of Technology Center for Transportation Studies Cambridge, Massachusetts 02139
Principal Investigator/ Author:	Ann F. Friedlaender
Title:	Technical Change in the Railroad Industry
Project Status:	Completed (Reports dated October 1980)

Abstract:

This study examined the question of whether regulation limits service innovation in the U. S. railroad industry. The investigators studied the introduction of two innovations, unit trains and intermodal service, in the United States and Canada to help demonstrate differences in innovative behavior within regulated and relatively unregulated environments. Researchers attempted to isolate the economic and regulatory forces that may have impeded or promoted utilization of these service innovations. In comparing the two countries the study focused on differences in cost, production functions and underlying technologies, and differences in constraints on industry consolidation and market segmentation. Findings are inconclusive due to problems in developing data for cross-country comparisons. This research indicates that regulations on intermodal ownership have probably had a greater impact on the growth of intermodal service than restrictions on rate setting. Another general finding is that the limited use of unit trains in the United States should probably be attributed to differences in economic forces (e.g., marketing strategies) rather than in regulatory environments.

Ordering Information: Available from NTIS.
Executive Summary: PB81-138463 (A02)
Part I, Piggybacking and Intermodalism: PB81-158180 (A11)
Part II, Unit Trains: PB81-158198 (A10)

********** 520 **********

Institution: Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Principal Investigator/
Author: James Utterback

Title: Innovation and the Evolving Structure of the Firm: A Framework for Technology Policy

Project Status: Active

Abstract:

The research study consists of a re-analysis of existing empirical research and recently collected data on innovation in products and processes, utilizing a conceptual framework that relates differences in innovative processes to the level of maturity of a firm's product and production process technologies. (The framework has been described and applied to the U. S. automobile industry by W. J. Abernathy in The Productivity Dilemma, The Johns Hopkins University Press, 1978). The research will (1) modify and extend the conceptual framework to include the case of firms with continuous flow production processes and further specify the limits of its generalizability; (2) extend the unit of analysis of the framework beyond the "productive unit" or simple firm to the case of the firm which manages a portfolio of lines of business; and (3) explore the conditions, possible causes and effects of "reversals" or "transitions" in the firm's innovative patterns. In addition to contributing to the further development and extension of the conceptual framework, the synthesis may help resolve some of the inconsistencies in findings regarding incentives for innovation which are prevalent in the research literature.

********** 521 **********

Institution: Massachusetts Institute of Technology
Sloan School of Management
50 Memorial Drive
Cambridge, Massachusetts 02139

Principal Investigator/
Author: Eric von Hippel

Title: Study of the Effectiveness of Mechanisms Used by Innovators to Capture Economic Benefit from Their Innovations

Project Status: Active

Abstract:

This project will investigate the effectiveness of three mechanisms that allow innovating firms to capture economic benefit from their innovations. These mechanisms are hypothesized to be the ones most likely to result in the capture of sufficient profits from the development of capital goods innovations by certain types of firms to encourage these firms to undertake R&D in areas protected by the mechanisms. It is further hypothesized that the firms most favorably protected by one or more of these mechanisms are the larger firms using (rather than manufacturing) the capital-goods innovation. The three mechanisms are (1) the strength of barriers preventing new firms from entering the industry, (2) the amount of lead time it would take the competitors of the innovating firm to catch up by means of imitating the innovative product, and (3) the possibilities for maintaining trade secrets for an attractive period of time.

This study will test these hypotheses by gathering data measuring the origins, costs, and benefits of developing a sample of cost-reducing process machinery innovations, and how the benefits are affected by the availability of profit-protecting mechanisms.

********** 522 **********

Institution:	Massachusetts Institute of Technology Department of Management Cambridge, Massachusetts 02139
Principal Investigator/ Author:	Eric von Hippel
Title:	Factors Influencing the Functional Locus of Innovation
Project Status:	Completed (Report dated November 1980)

Abstract:

This project studied product users and product manufacturers to determine under what conditions and why users are the most frequent sources of innovation. The study team hypothesized that differences in innovativeness depend on the relative ability of users versus manufacturers to capture benefits from innovation, i.e., patents and lead time. It was found that the effectiveness of certain benefit capture mechanisms did indeed vary as a function of the locus of innovation. In addition, relative abilities of different categories of innovators to capture benefits serve as good predictors of the sources of innovation in the sampled industry sectors. The study focused on one product innovation, the clinical chemistry analyzer, and selected process machinery innovations employed in such industry sectors as the fiberglass, tool and die, shoemaking, and silicon semiconductor.

Ordering Information: Available from NTIS.
Document: PB81-162224 (A07)

********** 523 **********

Institution: University of North Carolina, Chapel Hill
School of Business Administration
Chapel Hill, North Carolina 27514

Principal Investigator/
Author: Ramaiya Balachandra

Title: Critical Factors of the "Stopping Rule" in R&D Decisions

Project Status: Active

Abstract:

This study is designed to identify and evaluate critical factors underlying decisions to continue or terminate R&D or development projects in private firms after appreciable amounts of investment funds have been expended in those projects. The first part of the study entails a search to identify, reduce, and operationalize both environmental factors (such as government regulations and procurement activities, actions by major consumer groups, and the degree of product competition) and organizational factors (such as degree of support from the top management, the R&D management, or the presence of a project champion), and to account for the influence of these factors separately from the influence of project-specific factors (such as the probabilities for technical and commercial success, expected profits after commercialization occurs, and expected capital requirements).

The study team plans to analyze approximately 100 terminated projects in a variety of settings in this stage of the study, to determine the relative importance of individual (or groups of) environmental organizational and innovation-specific factors.

The second stage of this study has the primary objective of evaluating and refining the study to develop policy guidelines for R&D managers in the private sector and policy makers in the Federal science policy community. Included in this stage will be a symposium of experts in this field from industry, government, and academic organizations. The participants will discuss the findings of the first stage of this study in order to assist the study team in achieving the primary objective of the second stage.

********** 524 **********

Institution: University of Pittsburgh
Department of Industrial Engineering
4200 Fifth Avenue
Pittsburgh, Pennsylvania 15260

Principal Investigator/
Author: William E. Souder

Title: A Comparative Analysis of Phase-Transfer Methods for Managing New Product Development Innovations Within the Firm

Project Status: Active

Abstracts:

The project will assess the most effective means for a firm involved in new product development to deal with varying levels of uncertainty about product technology and product markets. Three alternative means for integrating the flow of work between marketing and R&D functions will be compared in settings with widely differing conditions of technological development and product obsolescence. The understanding of marketing and R&D relationships has important implications for both public and private sector decisionmakers. The study will suggest the arrangements between these functions that will improve the probability of commercial success for government of industry investment in new product technologies. It will also suggest how market influences such as regulation, government procurement procedures and tax incentives and relief relate to internal organizational processes of the firm.

Data will be collected in 28 field sites for 90 new product development projects utilizing a variety of interview, questionnaire, and unobtrusive techniques. The duration of the study is 20 months, with reports issued for each of the six phases of the research. The final report is due on January 15, 1981.

********** 525 **********

Institution:	Princeton University Department of Sociology 2-N-1 Green Hall Princeton, New Jersey 08540
Principal Investigator/ Author:	Robert Wuthnow
Title:	Networks of Scientific and Technological Information Exchange in the Technological Innovation Process
Project Status:	Active

Abstract:

The project will examine the role of interorganizational social network exchange during the early stages of technological innovation in two scientific-technical specialties: nuclear waste management, and solar photovoltaic systems. The components of the network will include not only scientific and technological researchers, but also policy, industry, and public groups influencing the research, development, and innovation process. An understanding of the nature of the relationship among these various components will: (1) further delineate the role of Federal personnel and groups as sources, intermediaries, or users of technical information; (2) help describe the impact of current Federal policies and programs on information exchange and innovation in these areas; and (3) suggest ways in which information exchange can be improved by Federal policy initiatives.

Data will be collected by means of structured personal interviews with 150-160 respondents in each of the specialty areas. Network analysis data-reduction techniques will be employed to describe the relationships between the respondents. The duration of the study is 17 months with the final report due February 1, 1981.

********** 526 **********

Institution: Rutgers University
Department of Sociology
New Brunswick, New Jersey 08903

Principal Investigator/ Author: Frank M. Hull

Title: Technical-Market Context, Organizational Design, and Industrial Innovation

Project Status: Active

Abstract:

The objective of this study is to determine the longitudinal stability and relative importance of such organization design factors as the specificity of R&D, decisionmaking structure, and the concentration and diversity of technical specialists within an organization, on the kind and rate of technological innovation in a variety of industries and industrial sectors (technical-market contexts). The study draws upon an extensive data base from a 1973 study of 110 manufacturing facilities located in the Northeast, and will gather current data from this same sample. It will document what has happened to these facilities, both organizationally and technologically, since 1973 and analyze patterns of changes across and within the various technical-market contexts represented in the sample. Such a longitudinal analysis will contribute greatly to our understanding of the strength and direction of the relationship between firm and organizational characteristics and the rate and direction of technological change.

The study is to be carried out over a two-year period, with the final report due April 15, 1982.

********** 527 **********

Institution:	University of Santa Clara Department of Marketing Santa Clara, California 95053
Principal Investigator/ Author:	Albert V. Bruno
Title:	An Empirical Examination of Venture Capital Allocation Decisions and Their Performance
Project Status:	Active

Abstract:

This study will examine the process whereby private venture capital is committed to private technological entrepreneurs. The research will focus on individual project proposals submitted to a sample of 25 to 50 cooperating venture capitalists during a 2-4 month period. It is anticipated this will generate a sample of approximately 1,000 proposals for in depth analysis. The study team will endeavor to measure the importance of factors that determine positive or negative funding decisions. A sample of 40 to 50 entrepreneurs whose proposals were denied will be contacted later on to determine their success in finding funds elsewhere and continuing their commercial operations. In order to provide greater external validity for this project, the study team will also conduct a national survey of approximately 800 venture capital firms to ascertain how they receive, evaluate, and select ventures to fund. Finally, a sample of 300 high-technology, "start-up" firms will be contacted to assess the importance and accessibility of venture capital to their operations.

********** 528 **********

Institution: Stanford University
Department of Sociology
Stanford, California 94305

Principal Investigator/
Author: Bernard P. Cohen

Title: The Relationship Between Research Team Social Structure and Team Innovation

Project Status: Active

Abstract:

The study will investigate the relationship between the organization of R&D teams and various measures of project success. Organizational factors to be studied include the number of distinct scientific disciplines and specialties of members of the team, the degree of formalization (rules and procedures), the degree of centralization (decisionmaking levels) and the type of role played by the team leader. The study will determine whether particular organizational structures are associated with outcomes such as the choice of bold, innovative goals, with the probability of achieving these goals, and with success in meeting the expectations of the larger organization and other clients of the R&D team.

The overall project will involve two intensive case studies, a mail survey of team leaders and members of the R&D team, and an evaluation of the products of research by external referees. Funding at this time is provided only for the intensive case studies. The results of the study will include documentation of the case studies, and further development of a design and instrumentation for future field research. This report is due May 1, 1982.

********** 529 **********

Institution:	Stanford University Institute for Communications Research Stanford, California 94305
Principal Investigator/ Author:	Everett M. Rogers
Title:	Modeling the Technological Innovation Process in the Private Sector: The Solar and Microprocessor Industries in Northern California
Project Status:	Completed (Report dated March 1980)

Abstract:

This report ends Phase I of a possible two-phase research program. The study team focused on the solar flat-plate collector industry and the microprocessor industry with the objective of generating a theoretical framework to be used as a guide to modeling the process of technological innovation in private organizations. Thirty-eight personal interviews were conducted with representatives of firms in the two industries, Federal Government officials, venture capital investors, and technical experts and trade associations officials. The final report presents tentative findings regarding five main research questions guiding this first phase. In addition the report states several hypotheses for further study in Phase II, which may be funded by PRA in the future depending on the outcome of a competitive evaluation.

Ordering Information: Will be available from NTIS.

********** 530 **********

Institution: Yale University
Department of Economics
New Haven, Connecticut 06520

Principal Investigator/
Author: Richard C. Levin

Title: Dynamic Competition: An Empirical Study of Technology and Market Structure

Project Status: Completed (Phase I Report dated June 1980)

Abstract:

The completed project constitutes Phase I of a proposed longer-term investigation of the relationship between technological change and industrial market structure. In the conventional view, misleadingly associated with Schumpeter, market structure is an exogenous determinant of innovative conduct and performance. We extend the theoretical framework and explore the empirical support for the view more properly associated with Schumpeter--that market structure is an endogenous consequence of past innovation and technical change, as well as a determinant of innovative behavior. The report contains three papers. The first is a new contribution to the family of evolutionary models developed by Richard Nelson and Sidney Winter, in which Schumpeterian competition is simulated with a focus upon the relative performance of markets with, respectively, high or low levels of initial seller concentration, high or low levels of latent technological opportunity, and high or low levels of appropriability of innovations. In the second paper, Richard Levin constructs and estimates on cross-industry data a model in which R&D and market concentration are endogenous variables embedded in a five-equation model. The key exogenous variables are measures of technological opportunity, appropriability, and demand elasticity. The results are largely consistent with hypotheses derived in theoretical models of Schumpeterian competition. Finally, Peter Reiss contributes an econometric technique for making use of disaggregated industry data despite the presence of only aggregated observations on one or more endogenous variables in a simultaneous equation system.

Ordering Information: Will be available from NTIS.

B. INNOVATION PROCESSES AND THEIR MANAGEMENT

2. Public Sector Innovation Processes

********** 531 **********

Institution: Battelle Memorial Institute
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

Principal Investigator/
Author: Jules J. Duga

Title: The Role of Intermediary Organizations in Technology Transfer

Project Status: Completed (Report dated October 1979)

Abstract:

The investigations were based on the premise that intermediary organizations (IOs) which represent the interests of elected and/or appointed state and local government officials can play an effective role in the transfer and diffusion of technology in the non-Federal public sector. The major objective of the research was to determine, through analysis of their attitudes, practices and capabilities, means by which the IOs can serve both their own clienteles and the aims of the various Federal technology transfer programs. Given their unique abilities to identify and aggregate the major needs of their members, and their well-established methods of information transfer (through workshops, conventions, newsletters, journals and the like), the IOs generally lack only the internal permanant staff expertise to conduct research. However, typical practice involves the use of external resources on an as-needed and project-specific basis. A significant role is played by the IOs in the translation of such research results to terms that are most applicable in the context of the eventual user. In general, involvement by IOs in technology transfer programs provides an element of "insurance" in that peer review, assistance and verification tend to reduce the risks involved in the testing or adoption of innovative approaches to state/local government service delivery. The IOs are thus in a position to provide support to more effective Federal efforts to transfer technology. Because of their representative position and the manner in which the Federal agency/IO/member relationship can operate, a greater role for the IOs is recommended in several areas.

Ordering Information: Available from PRA.

********** 532 **********

Institution: Indiana University Foundation
Political Science: Public and Environmental Affairs
P. O. Box F
Bloomington, Indiana 47401

Principal Investigator/Author: Lloyd A. Rowe

Title: Technological Innovation and Problem-Solving in Local Government: An Assessment of Current Research Methods

Project Status: Active

Abstract:

Previous studies of technological innovation in public organizations, sponsored by NSF and other agencies, have identified many features of local governments, technologies, and decision processes which are statistically linked to innovation. These findings have sometimes been difficult to compare with each other because no consistent measurements have been used for central concepts such as problem-definition, public-service values, external incentives for innovation, and structural characteristics of the agencies involved. This project will review several of these studies and compare the operational measurement of common structural and process variables, defining new and precise objective measures where necessary. The variables will be synthesized into a consistent model which can account for non-adoption of technology as well as for its adoption. A pilot test of instruments to measure these variables will be conducted at two sites. A report to NSF will assess the efficiency and utility of these measurements, and suggest strategies for further improvement in measurement precision.

********** 533 **********

Institution: Innovative Systems Research, Inc.
103 Cooper River Plaza East
Pennsauken, New Jersey 08109

Principal Investigator/
Author: Alan A. Paris
R. S. Braudy

Title: The Identification and Assessment of the Impact of Market Factors Upon the Commercialization of Individual, Federally-Sponsored R&D Projects

Project Status: Active

Abstract:

The program is a study of the impact of market and other market-related economic influences upon the commercialization of federally-sponsored, civilian-oriented R&D. The results of this research should be immediately useable by Federal decisionmakers and Federal project officers, enabling them to implement strategies to increase the likelihood that R&D will be commercialized at the lowest cost to the government. The program will develop strategies to allow market information to be incorporated into the selection, planning, and conduct of individual Federal projects. ISR intends to: (1) develop a scheme for identifying the characteristics of specific types of technology; (2) identify market and economic conditions impacting the commercialization of these different classes of innovations; (3) develop indicators to track the impact of market factors upon commercialization on an ongoing basis; and (4) provide a menu of policy-institutional strategies to enable Federal agencies to surmount market imperfections associated with individual innovations.

A methodological framework will be used which calls for innovation research to view, simultaneously, the impact upon commercializaton of economic (market), organizational and technology variables. Statistical and modeling techniques will be used to assess the influence of these variables, with individual research projects as the unit of analysis.

********** 534 **********

Institution:	Institute of Public Administration 1717 Massachusetts Avenue, N. W. Washington, D. C. 20036
Principal Investigator/ Author:	Eldon Sweezy
Title:	Commercialization of Federal Civilian Research and Development
Project Status:	Active

Abstract:

This research program focused on public/private sector interactions at the individual and industrial level. The program developed and tested a set of specific operational guidelines for managing the commercialization of federally sponsored civilian R&D. The framework for this study was a model of the commercialization process developed by the proposer for the Conservation and Solar Applications Division of the Department of Energy. This existing model defines the points at which industry and government must jointly decide on a mutual course of action.

The technical approach consisted of three major elements: (1) a data collection phase that captured and recorded the decision behavior and environment of projects and organizations as the commercialization process occurred (approximately 50 existing commercialization projects were examined during the phase); (2) a structured, contextual analysis of the data which identified decision criteria and modes of application (through this analysis cause-effect relationships were identified to aid public managers responsible for its commercialization of R&D in maximizing the instances of success and eliminating weak projects as early as possible); and (3) a series of feedback seminars for the analysis of funding, and for identifying key influences in commercialization.

The study is being conducted in two phases. The second phase which is on-going consists of continued data collection, a final feedback seminar and three one-day seminars. The latter is intended to disseminate key research findings and recommendations directly to program managers from government, industry, and the scientific community. A series of scholarly publications will be developed for further dissemination to the widest possible audience.

********** 535 **********

Institution: International City Management Association
1140 Connecticut Avenue, N. W.
Washington, D. C. 20036

Principal Investigator/
Author: Fred S. Knight

Title: Symposium on Innovation Diffusion in Local Government

Project Status: Completed (Report dated 1980)

Abstract:

The final project report summarizes the proceedings of a two-day symposium conducted in March 1979. The meeting served as a vehicle for establishing dialogue between scholars and practitioners of local government innovation diffusion. Over two dozen action steps were developed by symposium participants. Several of the steps considered to be most important focus on improvements in the services provided to local government officials by the public interest groups involved in implementing diffusion programs (e.g., ICMA, National League of Cities). Action steps include: (1) development of a coordinated innovation diffusion strategy; (2) development and advocacy of a research agenda reflecting local government R&D needs; and (3) micro- and macro-evaluation of the innovation diffusion system.

Ordering Information: Not available from NTIS.

********** 536 **********

Institution: Massachusetts Institute of Technology
Center for Policy Alternatives
Cambridge, Massachusetts 02139

Principal Investigator/ Author: Robert T. Lund

Title: Case Study of University-to-Industry Technology Transfer

Project Status: Active

Abstract:

This study plans to investigate a single instance of successful transfer of technology from a university setting to a private industry setting. The Natural Language Processing Group (NLPG) at MIT transferred a software system (text to speech algorithms) to Telesensory Systems, Inc. (TSI), of Palo Alto, California. TSI provided the necessary optical character recognition (OCR) technology to provide an input to the MIT software system, and plans to use the combined OCR-software package to develop a reading machine for the blind. TSI has had extensive market experience in producing commercial products for handicapped individuals.

The study team will prepare a factual, historical account of the cooperative effort between NLPG and TSI, analyze the historical process to identify problems and successes in the transfer process, and prepare a list of policy related factors that influenced the process in this case. These factors will be reviewed by a panel of experts assembled by the program manager and the principal investigator at the completion of the study. The factors will be ranked according to: 1) their impact (positive or negative) in this case, and 2) the extent to which (and directness with which) each factor is attributable to Federal policies, operating procedures, or regulations. This list will provide preliminary hypotheses about the impact of specific Federal policies and practices on transfers of technology from universities to industry. It is also anticipated that a case study will be prepared by the faculty at MIT, to be used as a teaching aid which will be made available to other colleges and universities after refining through the Intercollegiate Case-Clearing House at Harvard University.

********** 537 **********

Institution: Michigan State University
Department of Psychology
East Lansing, Michigan 48824

Principal Investigator/
Author: William S. Davidson

Title: Salient Processes in the Implementation of Technology

Project Status: Active

Abstract:

The proposed research will examine the relationship between the degree of implementation, routinization, and effective use of eight innovations in two mission areas, education and criminal justice. In these settings, the project will test a frequently-cited "research-development-utilization" model of innovation processes, as applied to technologies which, while science-based, have limited hardware components and significant possible variations in applications. The technologies to be studied will have been validated through experimental evaluation processes, will be in significant use in many sites, and will allow consistent and replicable measurement of outcome variables. They will be chosen in consultation with the Office of Education (OE) and the Law Enforcement Assistance Administration (LEAA).

A three-phase project is foreseen. During Phase I, adopters and non-adopters of the innovations will be interviewed to determine the relationships between organizational characteristics and adoption. During Phase II, interview data will be gathered on implementation, routinization, and re-invention aspects of the innovations. In Phase III, 72 adopters will be site visited to gather observational data on re-invention, routinization, desire for implementation, and effectiveness-of-use.

The study will be of use to Federal policymakers involved in technology transfer and dissemination programs in mission areas of a social nature.

********** 538 **********

Institution:	University of Michigan Institute for Social Research Ann Arbor, Michigan 48109
Principal Investigator/ Author:	Robert A. Cooke
Title:	The Implementation of Innovations by Municipalities: Resource Recovery Systems
Project Status:	Active

Abstract:

This project will study the processes involved in implementing community resource recovery technologies in municipalities. Resource recovery is an area of crucial national concern, with implications for both energy and materials policies and substantial Federal funding. A number of different technologies are available, and in implementing such systems communities tend to use one of three principal arrangements for outside contractor involvement: architecture-and-engineering (design only), turn key (design and construction), or full-service (complete operation). Little is known about the attributes of these arrangements or their relative effectiveness under different circumstances. Analysis of the implementation of resource recovery systems will aid understanding not only of these specific technologies but of innovation implementation process in municipalities generally.

Implementation will be analyzed in 55 sites through a combination of in-person and telephone interviews with multiple respondents at each site. Measures will be developed for aspects of the process such as perceived characteristics of the technology, characteristics of the implementation approach, characteristics of the city and its environment, and the fit between the technology and the structure used to implement it. The project will profile these implementation arrangements and using variables constructed from the interview data, test a series of hypotheses regarding the effects of implementation processes.

********** 539 **********

Institution: University of Michigan
Institute for Social Research
Ann Arbor, Michigan 48104

Principal Investigator/Author: Donald C. Pelz

Title: Use of Information in Innovating Processes by Local Governments

Project Status: Active

Abstract:

Considerable public and private resources have been devoted to disseminating technological information among public agencies, but studies of this process have demonstrated that mere exposure to technical information produces little innovative agency behavior. The present project will examine the relationships between expert technological knowledge and innovative problem-solving by local governments, particularly as mediated by public interest groups. Evidence is sought on how several kinds of information are obtained and used at various stages of an innovating process, and on what intermediary systems (such as intergovernmental networks) can do to facilitate such uses.

A comparative case design will be used involving structured data-gathering in 36 local government sites (12 in the hypothesis-generation phase, 24 in the confirmation phase). An advisory committee of technology-transfer experts will assist the researchers in selection of illustrative technical areas and research sites. Results will include (1) an assessment of relationships between information flows and agency innovation decisionmaking processes; (2) a description of strategies and mechanisms which would appear to constitute effective interventions by innovation-disseminators; and (3) an assessment of the role of Federal S&T policies in facilitating or constraining the ability of intermediary organizations to implement these strategies.

********** 540 **********

Institution: State University of New York at Albany
Graduate School of Public Affairs
Albany, New York 12222

Principal Investigator/
Author: John Rohrbaugh

Title: Innovation and Organizational Performance:
A Study of the Implementation and Routinization of a New Information

Project Status: Active

Abstract:

This project will conduct a longitudinal study of the interaction between technological innovation and organizational performance. It will study the implementation of automated job matching systems in state employment service offices, to increase our knowledge of how implementation of new technology for large-scale routine information processing is carried out in the public sector. It will examine the adaptation of the technology to the organization and focus attention on the effects of technological change on particular criteria of performance. Data will be collected at two points a year apart, using both survey and observation techniques, and the analysis will also make use of data previously collected by other sources over an earlier three year period. For many measures there will thus be a five year data base which will allow cross-time inference of causality. The study will increase understanding of both the dynamics and effects of certain types of automation in information technology, and contribute to the development of policies to use such automation effectively to increase the productivity of the public work force.

********** 541 **********

Institution:	Syracuse Research Corporation Social Sciences Division Merrill Lane Syracuse, New York 13210
Principal Investigator/ Author:	W. Henry Lambright
Title:	State-Local Relations and Urban Technology: A Study in Intergovernmental Decision-Making
Project Status:	Active

Abstract:

This project will investigate the respective roles played by state and local governments in facilitating or retarding technological innovation at the local level. Previous NSF research has explored the internal dynamics of innovation decisionmaking at both state and local levels, and has commented on the importance of state-local interactions (regulation, funding, approval mechanisms, and other actions) in shaping technology decision-making, but no integrated analysis of these interactions has been made. This study will focus explicitly on the intergovernmental coalitions which form around technological choices affecting both state and local governments. Using previously developed and tested conceptions of the innovation process and a structured innovation case-history methodology, two cases of intergovernmental innovation will be described for each of four governmental functions (education, law enforcement, etc.) in two contrasting cities within each of two contrasting states; a total of 32 case studies will be performed. Comparisons of innovation processes across technologies, functions, cities, and states will provide new information about how states and local governments interact in the context of urban technology, about the direct and indirect impacts and limitations of Federal policy on technology choices, and about significant leverage points in the intergovernmental innovation process.

********** 542 **********

Institution:	Syracuse Research Corporation Department of Marketing Management Syracuse, New York 13210
Principal Investigator/ Author:	David L. Wilemon
Title:	The Role of Industry in Urban Technology Transfer: A Comparative Profile
Project Status:	Completed (Report dated November 1979)

Abstract:

The objective of this research was to examine the role of industry in providing new technology, namely, fire, police, wastewater treatment, resource recovery, and mass transit equipment to local governmental agencies.

Intensive field interviews and questionnaires were used to gather data from 132 companies. Information was sought on the sources of new technological ideas; company new product development modes; marketing strategies used in promoting new technologies; role of intermediaries in technology transfer; competitive patterns; barriers to technology development and transfer; and the influence of Federal and state policy on innovation.

The research revealed that many urban markets could be characterized as "problem markets." Firms often experience low profits; low return on investment; fragmented markets; high marketing costs; and limited rewards for innovation attempts. In addition, governmental procurement regulations were often seen as a barrier to new technology commercialization. First, there is a growing industry conservatism trend toward high-risk programs in urban technology. Second, there has been a decline in urban industry invention and increasing reliance on technology transfer from other industries.

The research concludes that industry does have the capacity to meet most of the current technological needs of cities. However, industry's willingness to take risks in developing innovative new product development programs has been unintentionally dampened at times by government.

In order to meet the future technological needs of cities, industry needs assurance that governmental policy will be supportive of its efforts to develop and commercialize needed urban technology.

Ordering Information: Will be available from NTIS.

********** 543 **********

Institution:	University of Wisconsin-Milwaukee Board of Regents Departments of Urban Affairs and Political Science and Urban Research Center P. O. Box 413 Milwaukee, Wisconsin 53201
Principal investigator/ Author:	Richard Bingham
Title:	Assessment of the Cross-Situational Stability of Measures of Process and Characteristic Variables in Understanding Technological Innovation
Project Status:	Active

Abstract:

Two papers by George Downs and Lawrence Mohr on aspects of the theory of innovation in organizations have been very frequently cited in the literature, and occasional attempts to apply their ideas empirically have been made. Their approach suggests severe limits on the ability of research on large-scale technology-transfer programs to form generalizable conclusions, because of conceptual and methodological instability in the meaning of innovation measures in different settings. But no systematic operational test of their basic hypotheses has been made. This proposal will develop measures for the central variables whose properties have been questioned by Downs and Mohr, using data collected in a previous study by the present researchers (a random sample of 276 U.S. cities) in combination with public agency data to be obtained from the International City Management Association. Statistical analyses will determine the degree to which these data conform to the patterns predicted by Downs' and Mohr's analysis. The results will clarify several issues which are central in the development of the theoretical base for innovation policy research.

B. INNOVATION PROCESSES AND THEIR MANAGEMENT

3. Methodological Issues in Innovation Processes Research

********** 544 **********

Institution:

American Research Institute
Health and Welfare Group
7617 Little River Turnpike
Suite 800
Annandale, Virginia 22003

Principal Investigator/Author: Mary Ann Scheirer

Title: Methodological Issues in the Measurement of Implementation of Technological Innovations

Project Status: Active

Abstract:

Attention has increasingly been focused in innovation process research on the key factor of variability in technology implementation--that is, the ways in which technologies are put into use in organizations. But there remains considerable uncertainty about the most useful way to study this process. This project will conduct a systematic examination of issues concerned with the measurement of implementation of technological innovations and the related changes in organizational practices. Through an extensive literature review and cross-study comparison using a structured content analysis protocol, the research will explore past approaches to resolving several major issues in implementation measurement such as definition of technology characteristics, measurement techniques, units of analysis, fidelity versus adaptation, and process stage definition. It will then review the measurements used in a sample of previous technology implementation studies, and assess their utility, validity, and reliability. Finally, it will suggest preferred techniques or measures for future research which will increase the precision and replicability of technology implementation measurement. The study will enhance the analysis of innovation processes by highlighting methodological problems which have impeded the cumulative growth of knowledge in the field and suggesting ways of focusing more effectively on crucial dimensions of implementation.

********** 545 **********

Institution: Massachusetts Institute of Technology
Department of Urban Studies and Planning
Cambridge, Massachusetts 02139

Principal Investigator/
Author: Robert K. Yin

Title: Improving the Case Study Method for Policy and Innovation Studies

Project Status: Active

Abstract:

A large portion of current innovation process research involves partial or primary reliance on case study methods, either for hypothesis generation or for in-depth exploration of processes which cannot feasibly be studied in other ways. The case study need not and should not be less scientific and rigorous than methods such as surveys or experiments. Yet there is no clear set of criteria available to aid researchers or research sponsors in deciding when and under what conditions to conduct case study's features and avoid its pitfalls.

This project will develop methods for determining when and how to use case studies in innovation process research. A comparative analysis of about 50 case studies will be complemented by the use of two expert panels, one to rate the substantive impact of the studies analyzed and one to provide methodological criteria for judging them. The report will describe the major lessons learned from this comparison regarding the design and conduct of case studies in the innovation process research field, and will suggest appropriate relationships between the nature of the questions being asked, the choice of particular case study methods, and the results to be expected. This study will substantially increase the rigor and validity of the case method, and thus increase the degree to which this research is integrated with other methods to increase our cumulative knowledge of innovation process.

B. INNOVATION PROCESSES AND THEIR MANAGEMENT

4. Technology Transfer Processes Involving Developing Countries

********** 546 **********

Institution:	University of California Graduate School of Management Los Angeles, California 90024
Principal Investigator/ Author:	Robert H. Mason
Title:	A Comparative Analysis of Technology Transfer Practices: United States, European and Japanese Based Multinational Firms Operating in Brazil
Project Status:	Active

Abstract:

The purpose of this project is to determine whether there are major differences among the kinds of technology employed by multinational corporations in developing countries, based upon their country of origin. In particular, it seeks to determine whether patterns can be established for the use of relatively more labor intensive technologies, and, if so, whether this is because of the availability of proprietary technology, or because of differing factor costs or government policies at the time of selection.

The research will consist of interviews utilizing detailed questionnaires of matched pairs, triads, or quadriads of firms with similar product mixes and size operating in Brazil, and made up of one U.S., one Japanese, and wherever possible, one European, and one local firm. Between forty and fifty individual firms will be interviewed, and ten or more of these will be explored in depth as case studies of more labor-intensive technological adaptation. Various statistical procedures will be used to analyze the data. The research will result in one doctoral dissertation and several professional articles, as well as the final report.

********** 547 **********

Institutuon: Cornell University
Program on Science, Technology and Society
123 Day Hall
Ithaca, New York 14853

Principal Investigator/
Author: William F. Whyte
Erik Thorbecke

Title: Factors Which Influence Technology Choices in Developing Countries: Development of User Models

Project Status: Completed (Report dated January 1980)

Abstract:

Factors are examined which influence the choice of technology and its effects at various stages of economic development. The prime purpose is to formulate conceptual frameworks for analyzing technology choices (TC). The report presents two conceptual models for carrying out this function and discusses the following areas of concern: ongoing research on agricultural research and development (R&D) with respect to small (poor) farmers; effects that different forms of farm/firm organizations and market structure could have on TC; and efforts to analyze existing economic and engineering approaches and to examine the possiblities for fruitful interdisciplinary synthesis. Institutional research carried out in countries visited during the first phase of the study is reported with special attention devoted to preliminary assessment of contributions of S & T institutions to TC and industrial development. Major findings and plans for future research are summarized.

Ordering Information: Available from NTIS.
Document: PB81-181463 (A06).

********** 548 **********

Institution:	Fund for Multinational Management Education 684 Park Avenue New York, New York 10021
Principal Investigator/ Author:	Jack N. Behrman William A. Fischer
Title:	Overseas R&D Activities of Transnational Corporation and Science and Technology Policies of Less Developed Contries
Project Status:	Completed (Reports dated 1979 and 1980)

Abstracts:

This study reports on case studies, begun in 1977, of the conduct of R&D by transnational corporations in less developed countries. The final report describes R&D activities abroad based on five case studies and interviews with 58 international company officials of nine developing countries. Areas covered in the study include: reasons for locating R&D activities overseas, corporate mechanisms for control and guidance, the processes of innovation, the relationships of R&D to market strategy, and the impact of governmental policies on the location and operation of R&D abroad.

Ordering Information: Report entitled "Science and Technology for Development: Corporate Government Policies and Practices," is available from NTIS, PB 81-148789 (A01, microfiche only). Also available in hard copy from Oelgeshlager, Gunn & Hain, Publishers, Inc.
Executive Summary: Available from NTIS, PB81-149031 (A02).

********** 549 **********

Institution: Harvard University
Graduate School of Business Administration
Soldiers Field Road
Boston, Massachusetts 02163

Principal Investigator/
Author: Louis T. Wells, Jr.

Title: The Transfer of Appropriate Technology to Third World Countries: Developing Country Investors As a Source

Project Status: Active

Abstract:

The purpose of this project is to study selected successful cases of appropriate technology transfers to less developed countries (LDCs), and to abstract lessons for U.S. Government technical assistance programs and U.S. multinational corporations about how appropriate technology (adapted to small-scale manufacture, based on the use of standardized locally available inputs, and labor intensive) can be generated and transferred to LDCs.

The work should be useful to the U.S. Government as it develops programs to implement some of the decisions and commitments likely to be agreed to at the 1979 United Nations Conference on Science and Technology for Development, and as it reviews its foreign assistance programs. The findings may also be of interest to U.S. corporations operating in LDCs.

The research will consist of a number of tasks. The key one will be to develop a database on all LDC to LDC investment projects that can be identified by the researchers in selected key LDC investor countries: India, Indonesia, Hong Kong, Thailand, the Philippines, Nigeria, and Peru. These data will be supplemented by work funded by the Inter-American Development Bank on Latin American joint enterprises. These government and published sources are expected to yield information on in excess of 1000 projects, to which will be added the results of 100-150 firm interviews, stratified by geographic area, and product line. These data will then be used for a variety of statistical tests of hypotheses about the links between the kind of technology employed and the characteristics of the investing firms.

********** 550 **********

Institution: SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

Principal Investigator/
Author: Norman B. McEachron

Title: Technology Choices in Developing Countries

Project Status: Completed (Report dated April 1980)

Abstract:

A conceptual framework has been developed which reflects a systems approach to technology choice and identifies the crucial institutions influencing that choice in developing countries. The model is described for a closed economy and its extension to an open economy with transnational interactions. It is based on an expected-benefits matrix that specifies the net economic gain or loss that a particular interest group expects to receive from implementation of innovations. The report demonstrates the model's application to the generation and choice of mechanical technology in agriculture, focusing on Pakistan. Issues involved in the supply and choice of manufacturing technology in industry, including a discussion of the ferrous foundry industry in India, are examined. A significant issue is addressed--the influence of information and educational training on technical choices. Data from a pilot study support the hypothesis that education can influence technology choice at several levels. Included in the report are plans for future research.

Ordering Information: Available from NTIS.
Document: PB81-168544 (A12)

********** 551 **********

Institution:	Yale University Economic Growth Center New Haven, Connecticut 06520
Principal Investigator/ Author:	Gustav Ranis Robert E. Evenson
Title:	International and Domestic Determinants of LDC Technology Choice: Contrasting Agricultural and Industrial Experience
Project Status:	Active (First Phase Report dated June 1980)

Abstract:

This document reports the Phase 1 findings of a multiphase research project designed to look at three dimensions of technological choice and change in developing countries and the interaction among them. These dimensions include: (1) the price and non-price characteristics of the environment in which choice and change occurs, such as levels of and changes in market structure, effective protection and export orientation as well as relative factor and commodity prices; (2) the level of innovative effort induced by features of the environment; and (3) the outcome of innovative activity including changes in productivity, growth and income distribution.

Within this context, the first phase report concentrates on: (a) an historical comparison of technology behavior of Japanese and Indian cotton textile industries; (b) an examination of the relationship between the environmental indices of innovative activity and performance indicators such as sales, growth, productivity and the distribution of income in contemporary less developed countries (LDC's) with particular emphasis on India; and (c) an investigation into technology switching in response to changes in the relative price and/or demand changes in consumer industries, with special emphasis on the shift from traditional to modern agricultural production in Taiwan.

Ordering Information: Will be available from NTIS.

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C. SOCIOECONOMIC EFFECTS OF SCIENCE AND TECHNOLOGY

1. Contributions of Private and Public Investment in Science and Technology to Economic Performance

********** 552 **********

Institution:	Auburn University Economics Department Auburn, Alabama 36830
Principal Investigator/ Author:	Albert N. Link
Title:	A Study of the Allocation of R&D by Character of Use Within U.S. Manufacturing Firms
Project Status:	Final report in preparation

Abstract:

The main finding of this study is that a set of firm characteristics can be identified empirically as determinants of the firm's allocation of its R&D expenditures.

The analysis, based on a sample of 275 U.S. manufacturing firms, illustrates that (1) more profitable firms allocate a larger portion of their R&D to basic research relative to either applied research or development, (2) firms receiving Federal R&D tend to allocate a larger portion to basic research relative to development and to process relative to product innovations, (3) diversified firms allocate a larger portion to basic research relative to applied research or development, and (4) firms that are owner-controlled and owner-managed have a greater propensity to invest in basic research and process innovations than do firms with other forms of ownership control. Of these firms' characteristics, diversification and ownership control affect the composition of a firm's R&D, but not the level of its R&D spending. The level of spending is primarily related to profitability and the receipt of Federal R&D, holding constant characteristics of the industry in which the firm sells its products.

Ordering Information: Will be available from NTIS.

********** 553 **********

Institution:
Battelle Memorial Institute
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington 99352

Principal Investigator/Author: Richard S. Campbell

Title: Technology Indicators Based on Patent Data: The Case of Catalytic Converters

Project Status: Phase I completed

Abstract:

The central question addressed in this research is whether variables derived from patents can be used in the construction of valid and useful indicators of the stage of development of technological problem areas and the specific technological approaches within these problem areas. The technological problem area studied in Phase I was catalytic converter technology, which involves a number of specific, sometimes competing, technological approaches. The project developed indicators of the stage of development of that technology and its problem domains using a number of variables extracted from publicly available patent data.

Ordering Information: Will be available from NTIS.

********** 554 **********

Institution: Battelle Memorial Institute
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington 99352

Principal/Investigator/
Author: Richard S. Campbell

Title: Technology Indicators Based on Patent Data: Phase II

Project Status: Active

Abstract:

This is a continuation of NSF grant number PRA 78-20321. The central question being addressed in this research is whether variables derived from patents can be used in the construction of valid and reliable indicators of the stage of development of specific technological approaches to specified problem areas. The project is developing indicators using a number of variables extracted from patent data, such as, patent class/subclass, filing date, issue date, names of inventors, assignees, patents referenced, and scientific articles referenced. The first phase of this project was the design and demonstration phase and covered catalytic converter technology. The second phase will develop indicators of the stage of development of six additional technologies. All the technologies will be either automotive fuel economy technologies or emission control technologies. The development patterns suggested by analysis of the variables will be assessed for their validity by experts in the technologies studied.

This research will determine the usefulness of publicly available patent data in identifying the stage of technological development of individual technologies. If valid and reliable indicators can be developed, they could later be used to assess the economic prospects of individual industries and the possible impact of foreign competition as evidenced by foreign-owned patents.

********** 555 **********

Institution: Brown University
Providence, Rhode Island 02192

Principal Investigator/
Author: Ryuzo Sato
Gilbert S. Suzawa

Title: Analysis of the Effects of Basic and Applied Research on Productivity Gains

Project Status: Completed (Report dated June 1980)

Abstract:

The central aim of this study is to explain and predict the effects of research and development on productivity gains. Initially a simple model combining production function and optimal control theories is developed to deal with the intertemporal relationships among basic and applied research and productivity changes. Certain aspects of this model (Model I) are empirically tested against existing aggregate and sectorial R&D and productivity data. Results of the preliminary empirical investigation indicate that the original model is not realistic. Consequently, a second model (Model II) is developed and extensively analyzed. A special case of Model II is employed to compute implicit price rates of return for basic and applied research utilizing U.S. chemical industry data. While the model (Model II) developed in this study may eventually prove to be useful in understanding and predicting the effects of R&D on productivity changes, existing time series data are too limited to establish its validity or to estimate the model's underlying dynamic structure in order to conduct appropriate simulation experiments.

Ordering Information: Available from NTIS.
Document: PB81-168569 (A06)

********** 556 **********

Institution: Computer Horizons, Inc.
1050 Kings Highway North
Cherry Hill, New Jersey 08034

Principal Investigator/
Author: Mark P. Carpenter
Francis Narin

Title: Application of Citations of Science Papers Contained in Patents to Assess Relationships Between Science and Technology

Project Status: Active

Abstracts:

This project will study the connection between science and technology by examining citations made in patents to the scientific literature. Patents in six rapidly growing areas of technology will be looked at. The study will document and analyze the magnitude and characteristics of the citation linkage, providing quantitative data on the sector that performed the research, country of origin, source of research support, subject, and level (from basic to applied) of research for papers directly cited by recent patents. Second-generation papers (i.e., papers cited by the articles cited by recent patents) will also be examined for five patent subclasses to trace the indirect connection between basic science and technology. An analysis of the context in which the scientific literature was referenced in the patents will also be carried out in two patent areas to provide information on how the literature contributed to the invention.

********** 557 **********

Institution: Computer Horizons
1050 Kings Highway North
Cherry Hill, New Jersey 08034

Principal Investigator/
Author: Mark P. Carpenter
Francis Narin

Title: Ten Year Trends in U.S. Technological Dependence on Foreign Science and Technology as Indicated by Referencing from U.S. Patents

Project Status: Phase I report in preparation

Abstract:

This project is an exploratory study of U.S. dependence on foreign science and technology and of foreign dependence on U.S. science and technology. It will use data provided by patents granted in the United States from 1970 through 1979. The patents provide information on patent examiner citations of other patents and of scientific papers, both American and foreign. The project will be accomplished in two phases. The objective of Phase I is to establish the validity of using indicators of dependence based on citations. It will select a small sample of technologies to test for consistency the ratings of science and technology dependence derived from citations made by patent examiners with ratings of dependence made by R&D managers. Phase I results will be evaluated before Phase II work is begun. In Phase II, a large sample of products and the related technologies will be selected, and the data will be analyzed to determine the existence of and changes in U.S. dependence on foreign science and technology and foreign nations' dependence on U.S. science and technology.

The project will provide information about the linkages between science and technology and the relationships between international science and technology transfers and the U.S. economy. This kind of information could be useful to policymakers in addressing questions about funding levels for basic research and about the roles of domestic and foreign science and technology in determining the international competitiveness of American products.

********** 558 **********

Institution: University of Dayton
Dayton, Ohio 45469

Principal Investigator/
Author: Joseph P. Martino

Title: Indices of Technological Change

Project Status: Completed (February 1980)

Abstract:

Shifts in markets for specific commodities often are the result of technological change. In those cases, it may be possible to anticipate the shift by using suitable indices of technological change as leading indicators. The project examined three indices of technological change: numbers of foreign-held U.S. patents, numbers of papers published in technical and trade journals, and research and development (R&D) expenditures. Each index was applied to eleven specific commodities, to determine its effectiveness as a leading indicator of market shifts. For domestic markets, the Fisher-Pry substitution model, drawn from technological forecasting literature, was used to analyze displacement of one product by a functionally similar but technologically different product. The number of technical papers was tested as a leading indicator for this substitution. For import markets, an import demand model was developed, based on previous work reported in economic literature. Then, the technological indices were tested in the model as leading indicators.

In both domestic and import market shifts, technology was treated as a "residual." That is, the technological index was added in an attempt to improve the explanatory power of the economic model. Each of the indices was found to provide at least a one-year, and in some cases as much as a three-year, leading indication of market shift for at least one specific commodity. However, each index failed to provide any leading indication of shift for at least one commodity market in which technological change was known to have occurred. This research reached the conclusion that all three indices have good potential for serving as leading indicators of market shifts; however, more research is required to determine the conditions under which the indices are reliable.

Ordering Information: The report entitled "Test of Some Indices of Technological Change as Leading Indicators of Market Shift" will be available from NTIS.

********** 559 **********

Institution: MATHTECH, Inc.
P. O. Box 2392
Princeton, New Jersey 08540

Principal Investigator/
Author: Robert J. Anderson, Jr.
Carson E. Agnew

Title: A Micro-Economic Analysis of the Effects of Public R&D on the Private Sector

Project Status: Completed (Report dated February 1980)

Abstract:

Private companies perform a great deal of publicly funded R&D contract work, notably in connection with defense, space exploration, energy and health. The R&D is widely believed to have beneficial spillover effects on the private economy. Yet the evidence for spillover, based on either case studies or total productivity analysis, is inconclusive and conflicting.

This is a pilot study to investigate a third way of detecting spillovers. The idea is to work out the differences to be expected between firms performing public R&D and others. By theorizing about two expected differences, in the value of the firm and in the number of patents it develops, two sets of testable hypotheses are derived. A small data set is compiled, and the hypotheses tested on it. The results need cautious interpretation, since the sample of firms was small and not randomly chosen. One set of tests implies that each dollar of public R&D is equivalent to having a free contribution of 9¢ to the firm's private R&D budget; the other set implies a contribution of 25¢. Detailed suggestions are made on how to mount a full-scale study, and a discussion is given of the policy applications it might have.

Ordering Information: Report entitled "A Study Of Some Effects of Public R&D on the Private Sector" will be available from NTIS.

********** 560 **********

Institution: MATHTECH, Inc.
P.O. Box 2392
Princeton, New Jersey 08540

Principal Investigator/Author: Donald Wise

Title: The Impact of Public R&D on Patenting and Scientific Manpower Retention by Firms in the Private Sector

Project Status: Active

Abstract:

This project seeks to provide evidence of the effects on firms of federally-funded R&D performed by these firms. It will look for evidence of these effects by testing an hypothesis developed in a previous pilot study, "A Study of Some Effects of Public R&D on the Private Sector," Agnew et al., MATHTECH, February 1980. It concerns the impact of public R&D (by which is meant only that part of federally-funded R&D performed by the firm being analyzed) on the firm's patenting activity. The project will also formulate and test one or more hypotheses about the effect of public R&D on the firm's turnover of scientists and engineers. Evidence will be sought about the degree to which one can tell whether the effects on firms differ by industry on the one hand, and by funding agency or department on the other. Data for a sample of firms, probably yielding about 500 useable data points, will be assembled. The implications of the result for varying aspects of government/firm R&D contractual arrangements will be spelled out.

********** 561 **********

Institution: MATHTECH, Inc.
P. O. Box 2392
Princeton, New Jersey 08540

Principal Investigator/
Author: Donald E. Wise

Title: Study of the Impact of Public R&D on Productivity

Project Status: Completed (Report dated February 1980)

Abstract:

This report presents the results of a study of the effect of Federal research and development (R&D) spending on the private sector's productivity. Originally, the purpose of the study was to investigate the disparity between the high reported rates of return to privately funded R&D and the low-to-negligible rates for federally funded R&D. By making use of the longer time-series of data which had become available since the two principal earlier studies (Griliches, 1975, and Terleckyj, 1974), the study planned to analyze the returns to private and federally funded R&D on industrial productivity in greater detail, and with greater precision, than had previously been possible.

The study's final outcome differs from its original objectives, because they have been unable to find a significant, positive return to either private or Federal R&D. This failure comes despite careful data collection and preparation, and despite (or, perhaps, because of) faithful adherence to the standard, neoclassical model of productivity and R&D. However, the failure to find a significant result appears insensitive to changes in the model's specification and to certain possible data problems such as measurement errors.

Ordering Information: Available from NTIS.
Document: PB81-235202 (A14)
Executive Summary: PB81-235210 (A02)

********** 562 **********

Institution: National Academy of Sciences
Assembly of Behavioral and
Social Sciences
Washington, D.C. 20418

Principal Investigator/
Author: David Goslin

Title: The Study Project on Social Research and Development

Project Status: Completed (Reports dated 1978)

Abstract:

The National Academy of Sciences established an Advisory Committee on Social Research and Development to conduct a study of social research and development in the following phases: (1) description of the structure of public policy; (2) specification of the key features and characteristics of social R&D; (3) delineation of the areas in which social R&D appears to be closely coupled to policy goals and objectives; and (4) a classification and specification of ongoing and obligated social R&D. The committee examined Federal concerns about policy relevance and general quality of social R&D output and interagency coordination of efforts. The report will include recommendations for improvements in the organization and management of the Federal support for social R&D. Some of the volumes already published advance some recommendations.

Ordering Information: The following volumes are available from the National Academy of Sciences:
Volume 1: The Federal Investment in Knowledge of Social Problems (Study Project Report), May 1978
Volume 2: The Funding of Social Knowledge Production and Application: A Survey of Federal Agencies, September 1978
Volume 5: Knowledge and Policy: The Uncertain Connection, March 1978

********** 563 **********

Institution:	National Bureau of Economic Research 1737 Cambridge Street Cambridge, Massachusetts 02138
Principal Investigator/ Author:	Zvi Griliches M. Ishaq Nadiri
Title:	Patents, R&D, and the Private Value of Knowledge: Explorations in the Economics of Technological Change
Project Status:	Active

Abstract:

This project seeks to determine what information there is in a newly computerized data set on patents about the generation of knowledge from R&D activities and about the economic effects of that knowledge. At the firm level, the project will focus on whether patent counts are a meaningful measure of the value to firms of technical knowledge resulting from R&D. Questions will be asked about lags between R&D and the growth of knowledge, depreciation, and the value of patented innovations. The project will also provide a publicly available and documented data set on a large number of R&D performing companies. At the industry level, the project will attempt to incorporate patent data into time series models of total factor productivity. It will also survey the underlying data bases of recent industry level studies of R&D and productivity and recommend next research steps.

********** 564 **********

Institution: National Bureau of Economic Research
261 Madison Avenue
New York, New York 10016

Principal Investigator/
Author: M. Ishaq Nadiri

Title: Expectations, Financial Structure, and Compositional Changes in R&D as Determinants of Productivity Growth

Project Status: Active

Abstract:

The project will study determinants of firms' investment in R&D, and of R&D's impact on firm productivity. More particularly, the study will investigate: (1) the role of expectations about sales or output in a firm's decisions about investment in R&D; (2) the effect of the financial conditions of a firm or its R&D investment decisions; (3) explanations for interfirm variation in the effect of R&D on productivity; (4) reasons for a firm's changing the composition of R&D (basic vs. applied research, product vs. process related R&D) and the productivity effects of such changes. The intention is at the end to pull together the results of these investigations and previous work to design an integrated structural model of determinants and effects of R&D at the firm level, a model that could be estimated given the type of information available.

********** 565 **********

Institution:	National Planning Association 1785 Massachusetts Avenue, N.W. Washington, D.C. 20036
Principal Investigator/ Author:	Nestor E. Terleckyj
Title:	Effects of Research and Development, Capital Modernization, and Worker Skill Improvement on Productivity Growth of Industries
Project Status:	Final report in preparation

Abstract:

The project aimed at an analysis of the effects of changes in the different types of R&D capital stocks on productivity growth of industries in the presence of other factors influencing productivity. The data for the R&D capital stock (private- and government-financed R&D performed in industry and R&D embodied in its purchased inputs) were prepared for the period 1969-79 based on consistent R&D expenditure series for the period 1958-77 prepared from the NSF product line data. The results regarding the effects of R&D capital changes on productivity obtained for the period 1968-79 were disturbed by the energy price increases and cyclical fluctuations which occurred in the 1970s. Nevertheless they were strong enough to suggest, in conjunction with results of other research, a number of important inferences regarding the depreciation of R&D as a source of productivity gains, regarding the differences in the productivity effects of product and process R&D, regarding the role of government R&D in productivity growth, and also regarding the sensitivity of the results obtained to the method used in productivity measurement. Additional funds were obtained from private sources early in 1981 to conduct further follow-up analyses, testing these inferences with data for a longer and less disturbed period. The complete results and the R&D data base developed in this project will be included in a volume being prepared for completion later in 1981. The manuscript of that volume will be submitted to the NSF as a final report for the project.

********** 566 **********

Institution:	Northwestern University Evanston, Illinois 60201
Principal Investigator/ Author:	Frederic M. Scherer
Title:	Research and Development, Patenting, and the Micro-Structure of Productivity Growth
Project Status:	Active

Abstract:

The objective of this project is to provide improved insights into the determinants of productivity growth by exploring several related aspects of the linkages between technological innovation and productivity growth. A sample of corporate patents will be examined to determine industries of origin and industries of ultimate use. Using these data, a matrix of technology flows through the U.S. economy will be constructed. Patent data aggregated by industry of origin will be linked to information on 1974 R&D expenditures (from the Federal Trade Commission's line of business records) for analysis of inter-industry differences in the propensity to patent. Patent data will also be aggregated by industry of use to analyze (1) demand-pull inducements to invention, and (2) the effects of invention on the using industries' productivity change. Another part of the project will examine whether there has been a recent decline in the profitability of R&D investments.

********** 567 **********

Institution:	University of Oklahoma Norman, Oklahoma 73019
Principal Investigator/ Author:	Edward J. Malecki
Title:	Federal and Industrial R&D: Locational Structures, Economic Effects and Interrelationships
Project Status:	Active

Abstract:

This project is to study the geographic locational patterns of both federally funded and industrially funded R&D, their effects on regional economic development, and relationships between industrially and federally funded R&D.

The project consists of three parts. The first is to identify, in a geographically more disaggregated way than has been hitherto done, the geographical concentration of Federal R&D in a few firms, industries and locations. It will be investigated, for instance, whether the locational concentration of Federal R&D arises from large-scale support of a few large companies, or whether some areas have developed a variety of small R&D contractors. The second task is to look at local income effects of Federal R&D, at both metropolitan area and state levels of analysis. The third task is to look at interrelationships between industrial and Federal R&D spending, in locations and over time, at a disaggregated level. This task will include some literature review about government policies to stimulate innovation, and collaboration with British researchers who are also working on the regional development ramifications of technological change and policy aspects of R&D spending.

The project will attempt a synthesis of the three tasks within a framework of R&D locational decisions, economic effects, and technological, industrial, and regional policy.

********** 568 **********

Institution: University of Oklahoma
Norman, Oklahoma 73019

Principal Investigator/
Author: Edward J. Malecki, Jr.

Title: Regional Economic Effects of Federal R&D Spending

Project Status: Phase I--Completed May 1980

Abstract:

This study assesses the impact of Federal R&D spending on the economies of metropolitan areas in the U.S. The framework employed is a conceptual model of the subprocesses involved in the transfer of Federal R&D into local and nonlocal economies. The primary local impacts--income multipliers, new firm spin-offs, and agglomeration of technical ability--are tempered somewhat by the interurban transmission of economic effects. This conceptualization was examined by the use of Federal R&D compiled at the metropolitan area level for two time periods, corresponding to the mid-1960s and 1975-77.

The locations of Federal R&D in the aggregate as well as in most major agency and performer categories show little change over the period. In terms of overall concentration, defense R&D is among the least concentrated, but since it accounts for about 50 percent of the total Federal R&D effort, it determines much of the national pattern. In total Federal R&D in metropolitan areas, the top 15 urban areas receive over 70 percent of all funding.

The effects of Federal R&D are not discernible through income multiplier analysis; these effects on local income are either negative or insignificant rather than the expected positive effect. Agglomeration effects, on the other hand, are marked. Location quotients were used as a measure of disproportionate agglomeration of Federal R&D, and few urban areas (20) were notable concentrations of more Federal R&D than expected on the basis of population. Even fewer urban areas (11) are identifiable as centers of both federally funded and industrial R&D. The interurban redistribution of effects results in few urban areas receiving funding of any magnitude, and these are typically also the recipient locations of prime contracts. The overall effect, then, is a rather small and constant set of urban areas where Federal R&D takes place. Although short-term local income effects do not stand out, agglomeration of industrial R&D is reinforced in several cities, whereas it is either ignored or not stimulable in others. The comparative advantage of metropolitan areas in science and technology depends on both Federal and private industrial R&D for new firm growth and economic viability.

********** 569 **********

Institution:	University of Pennsylvania Department of Economics Philadelphia, Pennsylvania 19174
Principal Investigator/ Author:	Edwin Mansfield
Title:	Market Structure, International Technology Transfer, and the Effects on Productivity of the Composition of R&D Expenditures
Project Status:	Completed (Report dated 1981)

Abstract:

The research team carried out three types of studies. First, they investigated the recent shifts in the composition of industrial R&D expenditures, and studied the relationship between the composition of a firm's or industry's R&D expenditures and its rate of increase of productivity. To carry out this work, they obtained data from 119 firms that account for about one-half of all R&D expenditures in the United States. Among other things, the results indicate that an industry's or firm's rate of productivity increase seems to be influenced significantly by how much it spends on basic or long-term R&D. Second, based on a carefully selected sample of 65 cases, a study was made of the characteristics of the technologies transferred by U.S. multinational firms to their overseas subsidiaries, the extent to which these technologies have leaked out to foreign rivals, and the effects of these technology transfers on non-U.S. recipients. Third, based on detailed data concerning 48 new products, the researchers studied the size, determinants, and effects of imitation costs, and the effects of patents on the rate of innovation.

Ordering Information: Will be available from NTIS.

********** 570 **********

Institution: University of Pennsylvania
Department of Economics
Philadelphia, Pennsylvania 19174

Principal Investigator/
Author: Edwin Mansfield

Title: Studies of Federally Funded Research and Development, Market Structure, and International Technology Transfer

Project Status: Active

Abstract:

This project is concerned with some of the economic effects of R&D and innovation. It addresses gaps in knowledge that hamper analysis of three questions that concern policymakers: How does Federal funding of R&D in industry affect the allocation of firms' own funds to R&D? How does innovation by industrial firms affect the competitiveness of their industries? How is the productivity of U.S. firms affected by their overseas expenditures for R&D? These questions will be addressed in three tasks to be undertaken over a three-year period.

(1) The effects of Federal R&D funding on a firm's R&D will be estimated by industrial executives. These estimates will be obtained through personal interviews, and they will be validated against statistical information on past behavior. Explanations will be sought for interfirm and interindustry variations in firm behavior.

(2) The effects of important product and process innovations on industrial concentration will be investigated in the chemical industry. Specifically, the effects of 10 or more product innovations on the share of sales by the four leading sellers in "the market" defined for the product being considered will be examined. Also studied will be the effect of important new processes on the minimum efficient scale of plant (and of firm). Characteristics of innovations leading to increased or decreased seller concentration will be sought.

(3) The project will also study the effects of a U.S.-based firm's overseas R&D expenditures on its rate of productivity increase, both econometrically and with direct information from firms. This will be the first attempt to introduce international technology flows into models of productivity growth.

********** 571 **********

Institution:	Stanford University Stanford, California 94305
Principal Investigator/ Author:	Nathan Rosenberg
Title:	The Emergence and Growth of the Industrial Research Laboratory in the U.S. 1890-1970
Project Status:	Final report in preparation

Abstract:

This project is analyzing the development of the relationship between noncommercial (i.e., university- or government-funded) research and industrial laboratories. The approach is to trace the growth and evolution of industrial labs, focusing on their role in providing an effective link between science and technology, between basic research and subsequent application. The influence of the following factors is being investigated: the role of government, the structure of markets and demand for products, the institutional structure of organized research establishments, and changes in the knowledge base available to firms.

The project uses a substantial body of historical data from the National Research Council's Surveys of Industrial Research for 1940 and 1946.

********** 572 **********

Institution:	University of Virginia Thornton Hall Charlottesville, Virginia 22901
Principal Investigator/ Author:	J.E. Gibson
Title:	Possible Negative Cross-Impacts of Public Funding of R&D on Private Sector Development: A Dynamic Theoretic Game Model Approach
Project Status:	Completed (Report dated March 1980)

Abstract:

Technological innovation consists of the technical, industrial, and commercial steps which lead to the marketing of new or improved manufactured products and to the commercial use of new or improved production processes or equipment.

Federal funding of research and development (R&D) in public and private sector organizations (PSOs) is one of the more direct policies affecting technological innovation. Normally, Federal funds are offered to produce a positive impact on the PSOs and, in the aggregate, national productivity. However, in certain instances, the opposite effect, or negative impact, on private sector development occurs.

The research objective of this study has been to develop a dynamic theoretic game model which could be used to identify and quantify conditions under which the intervention by the Federal Government, via the offering of R&D funds, might induce negative cross-impacts on private sector development. The term negative cross-impact refers to the behavior of PSOs to reduce, delay, bar, or inhibit expenditures of funds on a specific R&D project of both private and public sector interest. A variety of game models were analyzed for appropriateness to our research objectives. After considering Cournot, Stackelberg, and Nash game formulations, the Stackelberg game model was selected as the most appropriate. To aid in the implementation of this form of game, stochastic optimal control theory has been used to recast the theoretic game into an operational state space model. No gaming is done.

Ordering Information: Will be available from NTIS.

C. SOCIOECONOMIC EFFECTS OF SCIENCE AND TECHNOLOGY

2. Distribution of Economic Costs and Returns from Science and Technology

********** 573 **********

Institution:	Duke University Department of Economics Durham, North Carolina 27706
Principal Investigator/ Author:	Henry Grabowski John Vernon
Title:	Studies on Drug Substitution, Patent Policy and Innovation in the Pharmaceutical Industry
Project Status:	Active

Abstract:

This project will address two topics: (1) the effects of recent developments relating to patenting and marketing of pharmaceutical products on the returns from drug innovation; and (2) the determinants of R&D expenditures by firms in the pharmaceutical industry.

Recently, laws have been introduced to provide for increased generic substitution which is expected to benefit consumers in the form of lower prices on multi-source drugs. These laws may also have impact on firms' R&D activities. Recognizing the benefits to consumers from generic substitution, the investigators will utilize the results of a cross-sectional examination of the various state substitution laws to undertake a sensitivity analysis of the interaction effects of both substitution and patent life changes on the expected returns from new product innovation. They will also examine how changes in expected returns, combined with other key determinants, will affect aggregate R&D expenditures and the allocation of the R&D budget among therapeutic product classes. This work, being one of the first studies to assess the impact of regulation on intellectual property rights and consequently on the capturability of the private returns associated with those rights, is a new and important dimension of the investigators' long term research on technological development in the pharmaceutical industry.

********** 574 **********

Institution: University of Iowa
Department of Economics
Iowa City, Iowa 52242

Principal Investigator/
Author: Shih-Yen Wu

Title: Methods for Measuring Social Returns from Innovation and Their Application to Pharmaceuticals

Project Status: Completed (Report dated 1980)

Abstract:

Cost-benefit analysis techniques are used to assess social returns derived from product innovations in consumer goods areas. The report presents rules which should be applied to assign research and development costs; techniques which could be used to measure social benefits derived from pharmaceutical innovations; and three empirical findings relating to the social and private rates of return from these innovations. In addition, the nature of an optimal public policy concerning generic product imitation in the pharmaceutical industry is examined. The research indicates that the proposed procedure for determining optimal imitation is applicable not only to consumer goods in general, but is also relevant to determining optimal dissemination of knowledge.

Ordering Information: Available from NTIS.
Document: PB81-168577 (A06)

********** 575 **********

Institution: Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Principal Investigator/
Author: Nicholas A. Ashford

Title: Case Studies in the Effect of Government Regulation on Innovation in the Pharmaceutical Industry

Project Status: Phase I--Completed March 1980

Abstract:

This project will examine the impact of government regulation on the process of pharmaceutical innovation, including methods of production of drug candidates, testing procedures, and the nature of the drugs developed. The empirical investigation will be a preliminary attempt to measure part of the benefits and costs to society from drug safety and efficacy regulation. The research will try to establish whether changes in the methods of drug development and testing have changed the nature of pharmaceuticals produced, e.g., from drugs for use in general radical practice to drugs designed for use in hospitals and large clinics or from drugs designed to offer relief from long-term symptoms of disease to drugs developed to manipulate more fundamental disease mechanisms. The research will also attempt to determine to what extent government regulation has induced these changes.

The research will be conducted in two stages. Investigations of regulatory influences in the first phase will allow development of working hypotheses and assessment of data availability in specific therapeutic areas. Preliminary testing of the working hypotheses based on data to be collected in case studies of three therapeutic areas will be done in the second phase. Means of testing the generalizability of the findings to other therapeutic categories will also be outlined.

Ordering Information: Report entitled "Relationships Between Aspects of Pharmaceutical Regulation, Innovation, and Therapeutic Benefits" is available from PRA.

********** 576 **********

Institution: Massachusetts Institute of Technology
Center for Policy Alternatives
77 Massachusetts Avenue
Cambridge, Massachusetts 02139

Principal Investigator/
Author: Nicholas A. Ashford
Dale Hattis

Title: Relationships Between Aspects of Pharmaceutical Regulation, Innovation and Therapeutic Benefits, Phase II

Project Status: Active

Abstract:

This project is the second phase of a study to examine the impact of government regulation on pharmaceutical innovation, including methods of choosing drug candidates, testing procedures and the nature of the drugs developed. Phase II objectives are to test the specific hypotheses developed in Phase I and to attempt to integrate them into a consistent framework. This objective will be carried out in three parts. The main focus will be on case studies of regulation/innovation relationships, to be conducted within three therapeutic classes--systemic antibacterials, antihypertensives, and antidepressants. These will include a systematic evaluation of the regulatory signals relevant to each class since 1962 and a comparison of the characteristics of sets of drugs which became available at similar times in the United States and some other developed countries with those which became available substantially earlier outside the United States. This will permit an intensive exploration within therapeutic areas thereby generating details which should be helpful in testing hypotheses about differential regulatory stimuli between classes and between different types of drugs within a given class. Second, initial observations will be extended over time for the eleven therapeutic classes selected for the initial part of the study in order to update the data base. Finally, an attempt will be made to classify all post-1950 New Chemical Entities (NCEs) as prototypes or non-prototypes in order to test the major observations that prototype innovation has been less adversely affected in the post-1962 era than non-prototype innovation. If changes in the nature of drugs developed in response to regulatory stimuli (such as an increased proportion of drugs providing a significant therapeutic advance) can be established, this will be an important step in establishing the social benefits and costs from regulatory intervention.

********** 577 **********

Institution: University of Minnesota
2642 University Avenue
St. Paul, Minnesota 55411

Principal Investigator/
Author: Ross E. Azevedo

Title: A Theoretical and Empirical Study of Compensation for Employed Inventors

Project Status: Active

Abstract:

This project is a preliminary study of relationships between systems of compensation for employed inventors and levels of inventive output. This study will gather information on actual compensation practices used by a sample of firms in five industries, develop measures of inventive output, develop a conceptual model relating compensation systems for employed inventors and inventive outputs, and derive testable hypotheses about the effects of different compensation schemes on such outputs. This project will make a start at generating information needed for an assessment of the effectiveness of systems used to encourage inventive activity by employed inventors, who are the source of the majority of U.S. inventions.

********** 578 **********

Institution:	Purdue University West Lafayette, Indiana 47907
Principal Investigator/ Author:	Frank M. Bass
Title:	Net Social Benefits from Diffusion of New Consumer Durable Technologies
Project Status:	Completed (Report dated 1979)

Abstract:

In the early stage of industry development, demand consists of initial purchase or adoption of the innovation. Demand grows to a peak and then declines as the market becomes saturated. The diffusion process is characterized as similar to the contagion process in the spread of disease. Holding constant price, demand growth is influenced by the relative importance of "innovators" and "imitators" in the population of consumers and by the contagion rate. When prices decline, the adoption process is speeded up and the market for the product is expanded. When price depends upon experience, or accumulated output, profit optimizing behavior of firms, and upon the adoption process, the rate at which price will fall will depend upon the learning rate parameter, demand elasticity, and upon the parameters of the contagion process. A theoretical framework has been constructed to permit the measurement of social benefits associated with the industry development process for consumer durable technological innovations. The framework provides the basis for conservative estimates of these benefits inasmuch as only the price-related benefits are considered and improvements in product quality are ignored. Estimates of the dollar value of social benefits for six consumer durable innovations have been made.

Ordering Information: Available from NTIS.
Document: PB80-204761 (A05)

********** 579 **********

Institution: University of Rochester
Center for Naval Analyses
1401 Wilson Boulevard
Arlington, Virginia 22209

Principal Investigator/
Author: James Jondrow

Title: The Effect of Regulation on Productivity Growth

Project Status: Phase I completed

Abstract:

This project explores the application of some econometric techniques to assess the effects of regulation (environmental and safety) on the use of resources to improve productivity, especially investment in R&D and in capital equipment for production. Two industries -- steel and auto -- extensively affected by regulation are studied. The intent is to capture the link between regulation and productivity growth beyond the simple measurement of factors of production diverted from "productive" uses. The main such link is the effect of regulation on the use of inputs to production, especially additions to capital equipment and R&D.

The first phase of this study develops an integrated model directed towards describing the mechanisms by which regulation affects productivity and towards measuring these effects. It also specifies and operationalizes key variables, identifies available data sources and evaluates them with respect to their adequacy and consistency. The second phase of the project would be directed towards estimating the econometric model developed in the first phase.

The results of this project should be of interest to officials and analysts concerned with the effects of regulation on industrial innovation and productivity.

Ordering Information: Will be available from NTIS.

********** 580 **********

Institution: University of Washington
Seattle, Washington 98105

Principal Investigator/
Author: Steven N. S. Cheung

Title: A Preliminary Investigation of Antitrust Restraints on Patent Combination Contracts and the Implications for Science and Technology

Project Status: Active

Abstract:

This project is a feasibility study to develop and test a procedure for assessing whether patent combination contracts improve or reduce the efficiency of R&D and invention in the private sector. Patent combination contracts include patent pools as well as cross-licensing agreements. The central hypothesis is that the ability to use an idea without reducing the amount available for others permits contractual arrangements for the use of patents such that the arrangements may be sources of economic efficiency. In contrast, the same contractual arrangements for ordinary goods would be socially inefficient. The study will provide a preliminary assessment of how antitrust policy affects returns in R&D activity by restraining certain combinations of patents.

The study will look at four sources of economic efficiency gains: (1) avoidance of litigation costs; (2) removal of restrictions on the use of improvement patents based on previously patented inventions; (3) reduction of the possible social loss from the use of inventions with higher costs; and (4) reduction of the costs of determining the comparative advantages of different inventors. The study will develop a procedure to assess whether patent pools or cross-licensing agreements are socially efficient relative to other options. It will apply this procedure to a number of cases. For each case, the study will determine when the four sources of efficiency are present in patent combination agreements and attempt an assessment of the extent to which the agreements may be the least-cost ways of obtaining these efficiency gains. The main data sources will be cross-licensing agreements and court transcripts of patent combination cases brought for restraint of trade reasons.

C. SOCIOECONOMIC EFFECTS OF SCIENCE AND TECHNOLOGY

3. The Effects of Science and Technology on Individuals and Social Institutions

********** 581 **********

Institution: University of California
Institute of Business and Economic Research
Berkeley, California 94720

Principal Investigator/Author: Francesco N. Nicosia

Title: Coping Behavior: An Empirical Study of the Consumer-Technology Interface

Project Status: Final Report in preparation

Abstract:

This report seeks to develop a theoretical and empirical base for understanding the consumer-technology interface. The objectives of this project are to obtain information in the following areas: What specific activities and patterns of activities describe consumers' relationships with high technology products in the maintenance/repair phase of product ownership? Do activities vary by types of products and levels of technological complexity? Do activities vary by types of consumers? What are the personal or social factors that influence the ways in which consumers deal with technologically complex products? The project will include both the development of a model of framework of consumer coping behavior and a two-part empirical study of consumer experiences and coping strategies. The first portion of the empirical work will be a cross-sectional survey, utilizing both recall of actual experiences and hypothetical situations to obtain information about consumer strategies in coping with product maintenance/repair. The second portion of the empirical work will use the behavioral sciences laboratory at Berkeley to investigate coping strategies under controlled information conditions.

********** 582 **********

Institution:	Center for Naval Analyses 2000 North Beauregard Street Alexandria, Virginia 22311
Principal Investigator/ Author:	Louis S. Jacobson
Title:	Labor Adjustment to Technical Change: A Multi-Industry Study
Project Status:	Phase II - Active

Abstract:

The overall project objective is to estimate employment changes and to measure earnings losses to displaced workers resulting from technological change in a set of interrelated industries centering on the steel industry. The research approach is to link an econometric model of the interrelated industries to an econometric model of associated labor markets.

Phase I accomplishments are: (1) Econometric models have been developed for the steel, automobile, aluminum, and iron ore industries. (2) Measures of technical change have been developed for these same industries. (3) Preliminary estimates have been made of employment changes due to technical change in these industries and of the extent to which employment reduction is accomplished through attrition rather than displacement of workers.

Tasks to be completed in Phase II are: (1) Refine measures of technical change for the four industries studied in Phase I, and estimate measures of technical change for a fifth industry, coal mining. (2) For purposes of tracing the effects of technical change through different industries, also build the construction and fabricated metal products industries into the model. (3) Use estimates of employment change, in combination with estimates of attrition, to estimate numbers of displaced workers for different groups of workers (e.g., by age, sex, job tenure). Use LEED data (a longitudinal data set drawn from Social Security records) to estimate earnings losses for different groups of workers.

Ordering Information: Limited number of Phase I reports available.

********** 583 **********

Institution: New York University
Institute for Economic Analysis
Washington Square
New York, New York 10003

Principal Investigator/Author: Wassily W. Leontief

Title: Effects of Technological Change on Employment

Project Status: Active

Abstract:

This study is to trace effects of technological change on earnings and employment for different categories of labor employed in the American economy. An input-output model of the economy will be used. It will permit integrated analysis of the effects of technological change in a given sector on employment and earnings of the kinds of labor employed in that sector ("direct effects"), as well as the effects of change taking place in other sectors ("indirect effects"). Shifts in the input-output structure over time will be analyzed in order to separate shifts due to technological change from shifts due to other phenomena (for example, changes in the level and mix of final output). The input-output analysis will include detailed analyses of industries which have experienced or are likely to experience rapid technological change. This will include construction of scenarios about future change.

********** 584 **********

Institution:	Purdue University Department of Psychological Sciences West Lafayette, Indiana 47906
Principal Investigator/ Author:	Jacob Jacoby James Jaccard
Title:	Assessing the Effects of Science-Based Information on Consumer Technological Choices
Project Status:	Active

Abstract:

Utilization by consumers of health and safety information for products subject to rapid technological change can be important for them in obtaining maximum benefits or in minimizing risks associated with changing technology. How consumers process information about products with rapidly changing technology also can play a major role in formulating product performance standards. These Federal information and performance standards in turn influence the rate, direction, and characteristics of R&D and technological innovation for consumer products. The project is designed to address the following fundamental questions: (1) Do consumers actually consider health and safety information in their purchase, usage, and disposal decisions regarding technologically innovative products? (2) If such information is considered, what impact does it have on decisionmaking concerning perception of risk and choice behavior? (3) What is the best source for conveying this information to consumers? and (4) Do different sociodemographic segments of society have different health and safety information needs and usage patterns? The questions are examined using a multi-method approach involving both standard verbal reports, such as questionnaires and interview instruments, and a simulated decisionmaking situation in which the subject interacts with a computer, permitting the study of choices of information types and sources as they actually occur. It is expected that the results would provide some guidance in assessing the influence of Federal information and performance standards for innovative consumer products.

********** 585 **********

Institution:	John L. Vrooman 5611 Woodview Austin, Texas 78756
Principal Investigator/ Author:	John L. Vrooman
Title:	Technology and Labor Market Segmentation
Project Status:	Completed (1981)

Abstract:

This is an exploratory project to develop data and assess a research approach for study of the different effects which technological change has on members of the labor force. The study has three objectives: One is to trace the influence of technological change on job characteristics; another is to identify the interaction between technical characteristics of jobs and personal characteristics of workers; the third is to assess the effect of the interaction between characteristics of technology and workers on earnings for different occupational groups.

In this project, information has been drawn from several sources to develop indices for technology and technological change. The indices and research approach have been applied for a few occupational groups, using summary statistics from the National Longitudinal Surveys and multiple regression analysis. Results of this exploratory project suggest that technological change does have different effects on earnings and on the returns to schooling for workers in different segments of the labor market.

Ordering Information: Will be available from NTIS.

4. Science and Technology and U.S. Private Sector International Transactions

********** 586 **********

Institution:	Charles River Associates 1050 Massachusetts Avenue Cambridge, Massachusetts 02138
Principal Investigator/ Author:	Robert W. Wilson
Title:	Assessment of International Technological Competitiveness: Television Receivers and Semiconductors
Project Status:	Completed (Report dated 1979)

Abstract:

This study analyzes the contribution of international technological competitiveness of U.S. firms to their international market performance. The study compares a successful product, semiconductors, with a recently less successful product, television receivers, for firms in the United States, Germany, and Japan. Market performance is considered in terms of international trade, profitability of firms, market shares, and earnings from direct investment and licensing. Technological competitiveness is considered in terms of levels of development and application of technology for U.S. firms relative to foreign study in analyzing the importance of relative technological competitiveness, compared to other determinants of market performance, such as relative costs and government trade and investment policies. Also, consideration is given to the effects of government policies on technological competitiveness.

This study should contribute to an understanding of the role of relative technological development in the international economic performance of U.S. industries. Such information is needed in order to address policy questions about government support of industrial R&D, trade agreements with other countries, and government involvement in private technology transactions.

Ordering Information: Available from NTIS.
Final Report: PB81-150187 (A07)

********** 587 **********

Institution: National Academy of Sciences
2101 Constitution Avenue, N. W.
Washington, D. C. 20418

Principal Investigator/
Author: Hugh N. Miller

Title: Studies on the Influence of Technology in Determining International Industrial Comparative Advantage

Project Status: Active

Abstract:

The purpose of this project is to extend and expand the studies being conducted by the Committee on Technology and International Economic and Trade Issues. These studies have examined for six classes of products the influences of international development and transfer of technology in determining shifts in international comparative advantage between the United States and other nations. In the analysis to date, the Committee, relying on U.S. experts, has concentrated on two sets of questions. One set is about the current state of the industrial sector and its market. The other category of questions concerns the dynamics of what has happened to the U.S. and foreign markets during the past quarter century. In this extension, the Committee will incorporate the views of foreign experts and will assess closely the role of policies of other countries and potential policy options for the United States.

These analyses will be accomplished by a structured discussion of a set of background studies at meetings of the committee and industry sector panels. Results of these studies and discussions will be released in a series of monographs. This proposal addresses the program objective of synthesizing and improving the knowledge available for public policy analysis on questions relating to the effect of the development and international transfer of technology in determining the comparative advantage of U.S. firms and industries.

********** 588 **********

Institution:	National Bureau of Economic Research, Inc. 261 Madison Avenue New York, New York 10016
Principal Investigator/ Author:	Irving B. Kravis Robert E. Lipsey
Title:	Multinational Firms and Host-Country Technology
Project Status:	Completed (Report dated 1980)

Abstract:

This project examines: (1) the impact of the operations of multinational firms on the technological capabilities of host-country firms, and (2) the effect of multinational firms' operations, including direct effects via host-country technology on trade and employment in the United States. The research focuses on industries that produce internationally traded goods that are usually considered "low R&D-intensive" industries.

For these industries, the study compares, at the firm and industry levels, two types of innovative activity: the innovation process (including R&D) through first commercialization, and technology transfers through foreign direct investment. At the level of the firm, the study compares U.S. affiliates to host-country firms. At the industry level, it compares manufacturing industries within each country.

The project tests methods for measuring technology transfer through foreign direct investment, and provides information about the consequences of these transfers, in terms of the competitiveness of U.S. industries and employment. Such information is useful in assessing policy options with regard to technology transfer, or in assisting low R&D-intensive industries in developing technology. Much discussion about U.S. Government technology assistance (e.g., Commerce Department impacted industries program) and about U.S. policy regarding international technology transactions for economic purposes revolves about these types of industries.

Ordering Information: Will be available from NTIS.

********** 589 **********

Institution:	National Bureau of Economic Research, Inc. 261 Madison Avenue New York, New York 10016
Principal Investigator/ Author:	Irving B. Kravis Robert E. Lipsey
Title:	Multinational Firms and Host-Country Technology
Project Status:	Phase II - Active

Abstract:

This project is part of a continuing grant to examine the relationships between U.S. foreign direct investment, U.S. trade, and technological capabilities of host countries. The objective of Phase II of the project is to study the determinants of foreign direct investment by American multinational corporations and the effects of that investment on U.S. trade and host-country technology. The objective will be accomplished in three steps. First, an analysis will be made of changes in U.S. foreign direct investment worldwide, over time, in order to: (a) compare firms' activities in licensing, exports, and foreign direct investment; and (b) examine how foreign direct investment affects the competitiveness of U.S. industries. Second, an analysis of three industries (chemicals, automobiles, and one additional, unspecified industry) will be conducted to determine types of firms most heavily involved in overseas production; types of production transferred abroad by country and date; and the effect of U.S. affiliates on host countries' production and trade. Third, for Canada and Sweden, an analysis will be made of takeovers by U.S. firms and the effects of U.S. ownership on host-country firms and industries.

This project will provide information useful in addressing a number of policy questions: information such as the types of industries faced with import competition; the effects of foreign direct investment on domestic production and exports; the impact of extraterritorial control of U.S. affiliates abroad; the effects of international technology transfer on U.S. competitiveness; and the role of foreign governments' trade policies on the competitiveness of U.S. products.

********** 590 **********

Institution: SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

Principal Investigator/
Author: Donald S. Green

Title: Assessment of U.S. Government Export Financing of High-Technology Products

Project Status: Active

Abstract:

This project is an exploratory study of the importance of government supported finance in enhancing U.S. high-technology exports. It will identify and measure the subsidy provided to U.S. producers through low interest, long-term U.S. Export-Import Bank loans to finance international sales of a selected group of U.S. products, specifically, commercial jet aircraft and oil and gas exploration and development equipment. A comparison will be made of U.S. firms' and foreign competitors' bids in specific country markets,in terms of financing and repayment agreements and other competitive factors, such as price of product, servicing, reliability, and performance specifications. The project will be accomplished in two phases. The objective of Phase I is to determine the availability and validity of data and cooperation of firms (buyers and sellers, both U.S. and foreign). It will also develop a framework for analyzing the data. Phase I results will be reviewed before a decision is made on whether to go ahead with Phase II. Phase II would collect data for a larger sample of bids and sales to test the framework statistically. The project will combine a case study approach with statistical analyses.

This project will provide information about institutional differences which determine the competitiveness of U.S. and foreign firms in selling high-technology products. This information could be useful in addressing policy questions about the role of the U.S. and foreign governments' policies, specifically export credit subsidies, in influencing the international competitiveness of U.S. high-technology exports.

********** 591 **********

Institution: Stanford University
Stanford, California 94305

Principal Investigator/
Author: M. Therese Flaherty
David J. Teece

Title: Private Returns from International Technology Transfer: An Exploratory Investigation

Project Status: Active

Abstract:

This project is studying several aspects of private returns from international technology transactions. First, it will examine the magnitude of returns, in terms of income generated by an innovation originated by a U.S. firm (royalties and fees) and the importance of reverse transfers back to the United States. It will also consider the importance of the returns from these international licensing arrangements on the returns to a firm's total portfolio of R&D projects. This empirical investigation will cover 60 innovations, representing about 300 transfers of technology, in four industries: petrochemicals, semiconductors, automobiles, and pharmaceuticals. Second, in collecting data on returns, information will be sought about how firms structure the contracts to capture returns (e.g., reverse transfers, territorial restrictions, bartering, payment provisions). Third, the study will analyze the timing of firms' foreign investment decisions in relation to investment decisions by rival firms.

This project is to provide methods for examining and measuring total private returns from international technology transactions by firms. This information will be useful for assessing policy questions and options about technology transfer.

********** 592 **********

Institution:	University of Texas Austin, Texas 78712
Principal Investigator/ Author:	Stephen P. Magee
Title:	A Pricing Model of International Trade in New Technologies
Project Status:	Completed (Report dated 1980)

Abstract:

The purpose of this project was to develop testable hypotheses for examining public policy options for international trade in new technology (via, e.g., exports, foreign direct investment, length of patent lives) by multinational enterprises. The project extends a theoretical model for pricing new technologies to the case of technologies not embedded in a physical product. The model examines changes over time in prices, amounts, and types of new technologies transferred by an innovating firm. The model also takes into account the essential aspects of technology creation and the rate at which emulating firms will profit from copying and selling new technology. Finally the project will also determine the feasibility of testing the model empirically.

Ordering Information: Available from PRA.

********** 593 **********

Institution:	University of Washington Graduate School of Business Administration Seattle, Washington 98195
Principal Investigator/ Author:	Tagi Sagafi-nejad Howard M. Perlmutter
Title:	Assessments of Instruments to Regulate International Technology Transfers for Economic Purposes
Project Status:	Completed (Report dated 1980)

Abstract:

This project organized two conferences. The subject of each is recent research results on mechanisms to control and regulate international transfer of technology. Instruments of control discussed include patents, technology pricing, taxations, and restrictive business practices. One conference examines each instrument of control in terms of its application to the regulation and control of technology and its transfer. The second conference examines how individual institutions evaluate the comparative costs and benefits of the various control instruments. Institutional assignments include the supplier and recipient firms, importing and exporting nations, regional groups (e.g., the Andean Group).

These conferences provide a broad coverage of the state of the art regarding research on technology transfer control systems. This information should be useful to the research community studying the process of technology transfer and its control. It should also help Federal officials in assessing decisions about U.S.regulation of international technology transfer and responses to controls instituted by other nations.

Ordering Information: Will be available from NTIS.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

1. Substantive Technology Assessment

********** 594 **********

Institution: University of Arizona
Office of Arid Lands Studies
845 North Park Avenue
Tucson, Arizona 85721

Principal Investigator/ Author: Kennith Foster

Title: Technology Assessment of the Commercialization of Guayule - Domestic Rubber Source of the Future

Project Status: Completed (May 1980)

Abstract:

A technology assessment has been conducted of the potential commercialization of the desert shrub guayule (Parthenium argentatus) as a domestic source of natural rubber for the United States. This study presents synopses of elastomer supply and demand projections during the next 20 years, the state of development of guayule technology, and the driving forces and constraints of guayule commercialization. Also included are the first publication of the development scenarios, projected consequences of guayule development, and public policy-issue-analyses. The study focuses on policy implications of alternative means of guayule commercialization. Major findings are summarized according to the following categories: (1) technology and agronomic practices; (2) economics; (3) environmental; (4) occupational safety and health concerns; (5) sociocultural dynamics; (6) public policy analysis; and (7) legal issues.

Ordering Information: Available from NTIS.
Document: PB81-195273 (A13)

********** 595 **********

Institution:	University of Arizona Office of Arid Lands Studies 845 North Park Avenue Tucson, Arizona 85719
Principal Investigator/ Author:	Kennith E. Foster
Title:	Technology Assessment of the Commercialization of Mexican Guayule
Project Status:	Active

Abstract:

Increasing worldwide demand for natural rubber in an unsettled international environment may threaten the uninterrupted supply of this important commodity. A promising alternative source of rubber is the guayule (wy-oo-lee) plant--a native shrub of the semi-arid plateaus of Mexico and the Southwestern United States. Development of this plant into a commercial source of natural rubber is the subject of a number of scientific research efforts both in the United States and in Mexico. If these efforts are successful and a new industry emerges, a number of important long-run changes can be anticipated.

This project will conduct a technology assessment of commercial development and utilization of guayule in Mexico focusing on social, economic, institutional, and environmental consequences. It is planned to be a joint undertaking by the University of Arizona Office of Arid Lands Studies (Dr. Kennith Foster, principal investigator) and The Centro de Investigaciones en Quimica Aplicada (Dr. Enrique Campos-Lopez, principal investigator). The National Science Foundation will provide support for the U.S. participation and the Mexican government will cover the effort at CIQA. The project will build on a technology assessment of the commercialization of guayule in the United States, which was previously carried out by the University of Arizona. The project affords an opportunity for scientific collaboration between both countries and is expected to provide valuable information for impending national decisions.

********** 596 **********

Institution: Boston College
Graduate School of Management
Chestnut Hill, Massachusetts 02167

Principal Investigator/
Author: John Diffenbach

Title: Problem Assessment of Time-of-Day Electricity Rate Structures

Project Status:

Abstract:

This study identifies the important long-term, indirect impact issues of time-of-day (TOD) pricing of electricity. It points out the potential for adverse societal consequences in the areas of electricity consumption, capital investment, decentralization of electricity generation, effect on solar energy, and night activity. A number of policy issues were identified dealing with mandatory vs. optional rates, strength of price signals, length of peak periods, revenue determination, speed of implementation, waiver provisions for those subject to pricing disadvantages, policy variations for different classes of customers, and Federal vs. state regulation of TOD standards and rates. This assessment provides a synthesis of findings as well as quantitative analyses of specifics. As the integrating methodology for this study, influence diagrams were chosen. Influence diagrams represent the initial qualitative step toward a more rigorous, intensive investigation of the impact issues by means of systems of dynamics methodology. The latter methodology is one of the recommended strategies for further study of these issues. Two supporting methodologies used in this report are limits analysis and the use of compatibility assessment for generating more plausible alternative contextual scenarios which could shape TOD pricing consequences.

Ordering Information: Available from NTIS.
Document: PB80-188261 (A09)

********** 597 **********

Institution: University of California, San Diego
La Jolla, California 92093

Principal Investigator/
Author: Clifford Grobstein

Title: An Assessment of the Impacts of Newer Genetic and Developmental Knowledge

Project Status: Active

Abstract:

The principal objective of this project is to conduct a technology assessment of potential human applications of recent advances in genetics. It is expected that the study will generate information that will help science and technology decisionmakers and the public anticipate and plan for contingencies associated with the implementation of these new technologies. Specific objectives of the technology assessment are to: (1) describe the new technologies, including how the technologies have evolved and how the technologies can be expected to develop; (2) identify and explicate the different views of the parties at interest, including a description of conflicting needs, values, and objectives vis-a-vis the new technologies; (3) specify potential impact areas, critical policy choices, and relevant institutional decisionmaking systems; (4) identify and analyze the unplanned effects of the new technologies; (5) compare the alternative policy and technological choices available to decisionmakers; and (6) identify and analyze the potential risks, benefits, costs, and uncertainties associated with alternative policy and technological choices.

********** 598 **********

Institution: Cornell University
Ithaca, New York 14850

Principal Investigator/
Author: Arnim H. Meyburg

Title: An Exploratory Analysis and Assessment of Electronic Message Transfer

Project Status: Active

Abstract:

The proposed research will address key questions regarding the use of electronic communications as a substitute for current mail practices. A variety of alternative providers will be considered. The use of new communications technologies may reduce the cost of providing mail service. It is expected that advances, such as electronic message transfer systems, if deployed on an appropriate scale, will be efficient and will stimulate broad private sector involvement. This could conceivably lead to a broad range of social impacts. Because the impacts of such technological changes often reach far beyond the primary sectors affected, any decisions regarding the use of a new technology must take account of not only how well it accomplishes its primary intended objectives but also consider secondary and tertiary impacts. A unique feature of the project is its formulation of the Nation's mail delivery system as a freight transportation problem. This will provide the initial framework for the technology assessment. Then an inventory of potential social impacts will be compiled and placed within a cost/benefit framework. Efficiencies in the use of energy and other resources will also be examined. The final report will present an information base and analysis which will contribute to an equitable development of electronic mail technologies.

********** 599 **********

Institution:
East-West Resource Systems Institute
Center for Cultural and Technical Exchange
Between East and West, Inc.
177 East-West Road
Honolulu, Hawaii 96848

Principal Investigator/
Author:
Robert H. Randolph
Bruce Koppel
Harrison Brown

Title:
A Technology Assessment of Biological Nitrogen Fixation

Project Status: Active

Abstract:

A key factor in the ability of agriculture to satisfy growing world demands for food has been the availability of inexpensive manufactured fertilizer. Projected increases in energy costs, however, may move reliable access to commercial fertilizers beyond the reach of the developing world as even the poorer farmers in the United States are experiencing difficulties. An alternative to supplying the nitrogen requirements associated with high plant yields by chemical fertilizers is biological nitrogen fixation (BNF). BNF is a natural process which can be adapted to field crops through strategies ranging from intercropping with legumes to genetically introduced BNF capabilities in significant nonleguminous plants. Recent breakthroughs in molecular genetics suggest that genetic modification will eventually permit BNF on a commercial scale. This project will examine the consequences of a shift to BNF methods for two crops, rice and corn, in the United States and the Philippines. It will concentrate on identification of: (1) societal factors that are likely to influence the rate and scope of BNF utilization; (2) groups and sectors which will be significantly affected by BNF use; and (3) the major policy issues likely to be generated. The research will be conducted by an international team of experts.

********** 600 **********

Institution:	George Washington University Program of Policy Studies in Science and Technology Washington, D.C. 20052
Principal Investigator/ Author	L. H. Mayo
Title:	Exploratory Technology Assessment of Computer Assisted Makeup and Imaging Systems (CAMIS)
Project Status:	Completed (Report dated March 1980)

Abstract:

This study is intended to increase general awareness of the benefits of computer assisted make-up and imaging systems (CAMIS) and of the stakes for all those who may be affected by it in the future. Other objectives are to: identify public policy issues that range beyond the awareness of any one cluster of interested parties so that such parties may participate in decision-making processes that affect their well-being; anticipate consequences that may be difficult to reverse if neglected; recognize alternative government roles, especially those that minimize direct involvement in private decision processes and other constraints on the autonomy of the private sector; and establish awareness and communication among parties whose interests may overlap as a result of CAMIS. Described are CAMIS technology and its evolution, clusters of public policy issues arising from CAMIS, and an overlying theme to integrate them. The study involved dissemination of 500 copies of CAMIS information to interested parties. Interviews, conversations, and workshops provided current knowledge of CAMIS development and encouraged an exchange of views on issues raised during this research.

Ordering Information: Available from NTIS.
Document: PB81-195893 (A19)

********** 601 **********

Institution: Institute for the Future
2740 Sand Hill Road
Menlo Park, California 94025

Principal Investigator/
Author: John Tydeman

Title: Technology Assessment of Teletext and Videotex in the U.S.

Project Status: Active

Abstract:

Computing and communication technologies have joined to produce a new hybrid technology: teletext and videotex. Its distinctive feature is the integration of information banks, editorial and indexing structures, computer and communication hardware and software, marketing management, and billing facilities. Through such an integrated system, millions of people could gain access to a wide array of information services. These services can be provided rapidly and inexpensively in the environment chosen by the user.

Because this evolving technology has the potential to change cognitive processes, it may well have significant impact on daily life. The objective of this study is to contribute to a better understanding of the potential of teletext/videotex and to gain insight into the broad technological and social consequences of widespread implementation. The research will focus on public policy issues and associated decisions expected to be faced contingent on different courses of development of teletext/videotex in the United States. The focus on policy issues and the associated decision points will provide policymakers, industry officials, and public interest groups with much-needed information for the assessment of this technology.

********** 602 **********

Institution:	The MITRE Corporation McLean, Virginia 22101
Principal Investigator/ Author:	Lawrence Newman
Title:	A Technology Assessment of Terrestrial Biomass Systems
Project Status:	Completed (Report dated 1980)

Abstract:

A technology assessment was performed on the use of terrestrial biomass systems in the United States between 1980 and 2010. Four systems for the production, conversion, and end-use of energy from biomass were chosen for study: gasohol production from corn; industrial use of wood energy; residential heating with wood; and methanol production from silvicultural energy farms.

These systems were selected because of their potential for making a significant contribution to energy supply before 2000. Another major selection criteria was the belief that these systems would broadly illustrate the impacts of producing, converting, and using biomass for energy. The assessment team generalized from these four studies to the widespread implications of using biomass for energy. Public policy issues are derived and options to resolve these issues are suggested.

Ordering Information: Will be available from NTIS.

********** 603 **********

Institution: University of Southern California
Los Angeles, California 90007

Principal Investigator/Author: Jack M. Nilles

Title: A Technology Assessment of Personal Computers

Project Status: Completed (Report dated September 1980)

Abstract:

This project is divided into three sequential phases: market and technology survey and baseline forecast; impact analysis; and policy analysis. The first phase summarizes research results of the project. Findings include an analysis of the current status and probable growth of personal computer technology (PCT), descriptions of personal computer (PC) users and their choice of applications, and some alternatives to PCT. Anticipated socio-economic impacts on society of the widespread use of PCs are summarized and specific public policy related implications of PCT are examined in the areas of education, employment, and technology innovation--particularly as the latter relates to international trade. The second examines technical developments that will influence the rate of diffusion of PCT among the general public; examines the probable market for PCs as a function of time; and describes possible evolutionary forms of PCs and an alternative mode of PC development. The third phase explores possible future modes of growth of PCs and related industries, assesses the impacts and consequences of that growth, and presents some of the policy issues and options which may arise as a consequence of PCT development. Various aspects of the decisionmaking process are addressed and detailed conclusions are presented.

Ordering Information: Will be available from NTIS.

********** 604 **********

Institution: SRI International
Decision Analysis Department
333 Ravenwood Avenue
Menlo Park, California 94025

Principal Investigator/
Author: Miley W. Merkhofer

Title: Technology Assessment of Public Key Code Systems

Project Status: Active

Abstract:

This project will conduct a technology assessment of cryptographic methods to protect the storage and transmission of data and other information. The focus will be on public key codes which obviate the need for each user to hold a secret key. The increasing demands for protection of electronically processed information have provided the impetus for examination of the consequences of using such public key codes in a variety of applications. The theoretical basis for public key codes is provided by so-called "trap door" functions. These functions have the useful property that permits the information to be converted into a form that, like a trap door, makes it easy to get in, but hard to get out.

Widespread use of this technology is likely to result in a variety of unpredictable social impacts. This project will examine the social and institutional consequences of the uses of this technology and identify policies which need to be considered in its implementation. Results are expected to be of use to private corporations, banking and financial institutions, and government agencies and legislative bodies involved in policy formulation regarding the use and protection of information.

The methods of approach will utilize a decision analysis framework and will involve a variety of experts in law, sociology, mathematics, and public policy, among others.

********** 605 **********

Institution: Technology Futures, Inc.
2200 Guadalupe Street
Austin, Texas 78705

Principal Investigator/
Author: John H. Vanston
David O. Frederick
Kenneth D. Roberts

Title: A Technology Assessment of Alternate Means for Meeting Anticipated Demands for Electric Power in the U.S.A.

Project Status: Active

Abstract:

There is strong evidence that over the next three decades the share of national energy supplied by electric power will grow. Increased dependence on electricity will have important policy implications, possibly narrowing options available to end-users of energy. Potential vulnerability of power generation systems could increase, and environmental and safety issues could also arise. This research will examine the consequences of an increasingly electrical national energy system in order to identify public policy choices which could arise as a result. The research will utilize an interdisciplinary staff supplemented by expert panels to carry out analyses. The project will develop several scenarios concerning a spectrum of possible power generation futures which will illustrate a range of broad public issues and compare policy alternatives which may arise. Results will be useful to a variety of agencies and groups who are involved with energy policy.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

2. Institutional Aspects of Risk Analysis

********** 606 **********

Institution: University of California
Institute of Personality Assessment and Research
Berkeley, California 94720

Principal Investigator/ Author: Kenneth H. Craik

Title: Perceptions of Decision Procedures for Managing Technological Hazard

Project Status: Active

Abstract:

The overall purposes of this study are to explore: (1) expert and nonexpert preferences for various decision procedures used by government agencies and other institutions in establishing acceptable levels of risk, and (2) sources of variation among experts and nonexperts in their risk perceptions and preferences for particular decision procedures. The analysis will be based upon data collected through in-depth interviews with approximately 400 people. In the conduct of the study, special attention will be given to decision procedures based on cost-benefit analysis, expressed preferences, revealed preferences, and technical and political judgments. The overall objectives of the project are (a) to develop an understanding of the fundamental laws governing perceptions of risk and preferences for decision procedures; and (b) to help individuals and policy decisionmakers make better decisions about risk. By accomplishing these objectives, it is expected that improved procedures for citizen participation in the assessment of technological risk can be identified and developed.

********** 607 **********

Institution: University of California
School of Engineering and Applied Science
405 Hilgard Avenue
Los Angeles, California 90024

Principal Investigator/
Author: David Okrent

Title: Alternative Risk Management Policies for State and Local Governments

Project Status: Active

Abstract:

Responsibility for dealing with the consequences of many hazards falls directly under the authority and control of local governments. State and local decisionmakers do not, however, have the detailed risk, benefit, and cost information needed for effective hazard management.

The research objectives of this study are: (1) to identify several risk situations subject to local control; (2) to quantify, wherever possible, the risks, uncertainties, benefits, costs, and other important attributes associated with each risk situation; (3) to provide background material on other risk situations of concern to state and local decisionmakers; (4) to examine the existing status of risk management and regulation at the state and local level; (5) to propose and evaluate alternative risk management policies. It is expected that state and local decisionmakers will use the results of the study to improve risk management policies.

********** 608 **********

Institution:	Franklin Pierce Law Center 2 White Street Concord, New Hampshire 03301
Principal Investigator/ Author:	Michael S. Baram
Title:	An Examination of Alternatives to Government Regulation for the Management of Technological Risks
Project Status:	Active

Abstract:

In the last two decades, the U.S. Congress has enacted numerous laws to regulate technological risks and the various regulatory agencies have responded by greatly expanding their screening and monitoring efforts. This increase in government regulatory activity has raised several important issues, including the cost of enforcing compliance and the apparent complexity of the enforcement apparatus. Other risk management strategies to replace regulations and to reduce the need for future regulations have been considered; however, no effort has yet been made to systematically identify and compare major alternatives. The objectives of this study are: (1) to develop a conceptual framework for identifying alternatives to government regulation for the management of technological risk; (2) to develop baseline information on risk management strategy options; (3) to develop and apply criteria for comparatively assessing risk management strategy options; (4) to use case studies to modify the conceptual framework and criteria for assessing strategy options; and (5) to identify likely obstacles to the implementation of alternative risk management strategies. It is expected that private and government decisionmakers will be able to use the results of the study.

********** 609 **********

Institution: New York University
Graduate School of Public Administration
Public Policy Research Institute
4 Washington Square North
New York, New York 10003

Principal Investigator/ Author: Rae Zimmerman

Title: The Management of Risk: An Organization-Theoretic Approach

Project Status: Active

Abstract:

The purpose of the proposed research is to systematically map out a management system for high-risk technologies. It is intended to concentrate the analysis in the area of toxic substances. The relevant research issues include: the organizational and managerial linkages among the various components of the system; the perceptions of risk by administrators and their relationship to organizational norms; the specific relationships between organizational norms and administrative structures that either favor crisis management or anticipatory risk assessment; and, finally, the needed flexibility of the management system to permit it to respond to both short-term and long-term demands.

The research approach is to employ case studies and statistical analyses of both crises management and risk assessment organizations and events to outline the decision system. Results of the research will contribute to the formulation of a basic model of risk management covering the initial determination of the risk through the actual management stage.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

3. Utilization of Technology Assessment and Risk Analysis

a. Technology Assessment

********** 610 **********

Institution:	University of California Center for Research in Management Berkeley, California 94720
Principal Investigator/ Author:	Peter C. Wilton John Myers
Title:	Research on the Utilization of Technology Assessment Information
Project Status:	Active

Abstract:

This is an experimental study on how information produced by technology assessments (TA) is utilized in policy analysis. The overall objective is to improve the utilization of technology assessment reports. The rationale for the research stems from the need to better understand how policymakers process information from assessment reports. A number of previous descriptive studies have identified some factors which users of TA information believe to affect utilization. This research will utilize these previous results but will focus on experiments to measure the effect of qualitatively different types of information and different levels of information load. The research will be conducted in the laboratory facilities of the Center for Research in Management at the University of California, Berkeley, using computer-controlled interactive interviewing procedures.

********** 611 **********

Institution:
Forecasting International, Ltd.
1001 North Highland Street
Arlington, Virginia 22210

Principal Investigator/Author: Marvin Cetron

Title: Evaluation of Technology Assessments and Development of Evaluation Protocols

Project Status: Active

Abstract:

The purpose of the present work is to examine a group of technology assessments to determine whether there are any consistent patterns of analysis which cut across different technologies. The research will: (1) provide a method of structuring previously performed technology assessments in a way that presents the important assumptions, information, and policy recommendations in a concise, easily retrievable format; (2) contribute to the development of a general protocol that may ultimately be applied to all technology assessments performed in the United States (and with modifications, elsewhere); (3) ultimately contribute to the development of guidelines for performing future technology assessments, based on the improved understanding of the problems and advantages of the various methods of integrating key elements of technology assessments which were previously or currently in use; and (4) focus on effective communication of the results of technology assessments. The overall goal is to help the program staff to manage technology assessment studies efficiently. The outcome of this activity will provide a summary report that will illuminate the salient features of the analyses for use by policymakers and the general public alike.

********** 612 **********

Institution: University of Oklahoma
College of Engineering
Norman, Oklahoma 73069

Principal Investigator/
Author: Charles E. Barb, Jr.

Title: A Midwestern Regional Workshop in Technology Assessment

Project Status: Active

Abstract:

The workshop, convened in early 1977 under the sponsorship of the University of Oklahoma, examined a series of challenges facing the Midwest, such as energy, food production, weather modification, health service systems, and the like. At the same time, a number of sessions were devoted to technology assessment case studies, techniques and methodologies, as well as review of a wide array of analytical tools in technology assessment. Finally, the workshop reviewed the efforts of the Federal Government in technology assessment, pioneering studies at the state and local levels, and generally the role of technology assessment in planning and policymaking.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

3. Utilization of Technology Assessment and Risk Analysis

b. Risk Analysis

********** 613 **********

Institution:	SRI International 333 Ravenswood Avenue Menlo Park, California 94025
Principal Investigator/ Author:	Miley W. Merkhofer
Title:	A Comparative Study of Risk Analysis Approaches
Project Status:	Active

Abstract:

The public has become increasingly aware of the risks imposed by technology and has placed much of the responsibility for monitoring and managing these risks on government agencies. Consequently, legislators and regulators are faced with complex decisions requiring trade-offs among risks, benefits, and costs. Over the past two decades, decision analysts have developed a well-defined method for analyzing such complex decisions. The overall objective of this project is to compare the decision analysis methods with other methods for the analysis of decisionmaking (such as cost-benefit analysis, cost-effectiveness analysis, and value-impact assessment) and determine its applicability for risk analysis. Specific objectives of the study are (1) to examine the strengths and weaknesses of each method; (2) to determine the limits of applicability of each method; and (3) to summarize the results of the comparison in a matrix characterizing each method along several dimensions, such as theoretical justification, input data requirements, and ease of use. An important element of the research plan is to develop case studies of selected risk analysis applications. The case studies will be used to evaluate (1) the extent to which various methods logically account for available alternatives, technical information, and relevant preferences, and (2) the compatibility of various methods with the objectives and institutional constraints of government agencies. It is expected that the results and conclusions of the study will be useful to researchers and policymakers.

********** 614 **********

Institution: The J. H. Wiggins Company
1650 South Pacific Coast Highway
Redondo Beach, California 90277

Principal Investigator/
Author: Lloyd L. Philipson

Title: An Integrated Analysis of Risk Assessment Methodologies and Their Employment in Governmental Risk Management Decisionmaking

Project Status: Active

Abstract:

In recent years, decisions affecting science and technology policy issues have increasingly relied on risk assessments, including estimates of the severity of risk and of public attitudes towards technological hazards. In view of the complex interplay between risks and benefits, the assumptions underlying risk assessment have been widely challenged. One such challenge addresses the methodological adequacy of the methods employed in risk assessment. The overall objective of this project is to respond to this challenge by a comprehensive survey and critical analysis of risk assessment methods and their employment by policy analysts and policymakers. On the basis of an analysis of public documents, specific objectives are: (1) to identify the range of Federal risk management activities; (2) to examine the decision and policy analysis processes associated with such activities; and (3) to investigate the extent to which formal risk assessment methods can be used in risk management decisionmaking. In the survey and analysis, the project will focus on three major types of hazardous systems: energy systems; public transportation and hazardous materials transportation systems; and chemical processing and storage systems. It is expected that the results and conclusions of the study will be useful to researchers and risk management decisionmakers.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

4. Technology Assessment and Risk Analysis Methodology

a. Technology Assessment

********** 615 **********

Institution: University of California, Berkeley
Institute of Governmental Studies
Berkeley, California 94720

Principal Investigator/Author: Todd R. LaPorte

Title: Assessment of Alternative Energy Technologies: An Institutional Analysis

Project Status: Active

Abstract:

Deep concerns of state and Federal governments and industrial and residential users about future supplies of fossil fuel will most likely lead to the introduction and extensive use of alternative energy sources and technologies. Large scale deployment of new technologies has historically been accompanied by significant social dislocations which tended to modify the technologies as well as the social institutions involved. In order to be able to plan for the process of adaptation, it is important that our understanding of these subtle but important changes and their interaction with existing organizational structures be significantly expanded. It is the purpose of this research to do just that.

This study will analyze the character and extent of such changes as may accompany the introduction of new technologies, particularly those based on renewable sources of energy or a reduced scale of installation. Existing data on the energy systems of California will be compared to the theoretical predictions. The ultimate goal of this and related research is to help formulate a dynamic description of the processes of adaptation.

********** 616 **********

Institution:	Portland State University Futures Research Institute Department of Systems Science P. O. Box 751 Portland, Oregon 97207
Principal Investigator/ Author:	Harold A. Linstone
Title:	Alternative Models of the Decisionmaking Process and Their Applications to Technology Assessment
Project Status:	Active

Abstract:

In performing technology assessments, most analysts have based their predictions on a rational actor model of the decisionmaking process. The overall objective of this study is to examine several alternative models of the decisionmaking process and to explore their potential for improving the usefulness of technology assessments. Specific objectives are: (1) to critically review the literature related to three basic models of the decisionmaking process--the rational actor model, the organizational behavior model, and the multiple decisionmaker model; (2) to apply these models to several ongoing and completed technology assessments; and (3) to evaluate the potential of these models for improving the usefulness of technology assessments in the policymaking process. It is expected that the results of the study will be of value to practitioners and users of technology assessments.

********** 617 **********

Institution:	Stanford University Department of Engineering-Economic Systems Stanford, California 94305
Principal Investigator/ Author:	Ronald A. Howard
Title:	An Application of Decision Analysis to Technology Assessment: An Assessment of Decentralized Waste Treatment Methods
Project Status:	Completed (Report dated May 1981)

Abstract:

This technology assessment of waste management systems for individual households focuses on decisionmaking rather than on prospects of technological advance. Technologies assessed include on-site methods of waste disposal such as septic tanks, compost toilets, sand filters, mound systems, and greywater filtering, among others. Decision analysis methodologies used in the study allow for the explicit treatment of decisionmaking at each hierarchical level--Federal and state government, local community government, and individual consumers. The report outlines the scope of the analysis and discusses influences on decisions made by each of the hierarchical levels, including industry. Impacts described are generalizations based on information gained from a study of relevant literature, consultation with experts, and detailed case studies (separate report). Conclusions about the interactions of decisions of these various groups are summarized.

Ordering Information: Will be available from NTIS.

D. TECHNOLOGY ASSESSMENT AND RISK ANALYSIS

4. Technology Assessment and Risk Analysis Methodology

b. Risk Analysis

********** 618 **********

Institution:	Clark University Department of Technology, Environment, and Development Worcester, Massachusetts 01610
Principal Investigator/ Author:	Robert Kates
Title:	Methods for Improving Public Policy for Technological Hazard Management
Project Status:	Active

Abstract:

The control of technological hazards has become a major concern of society. Although there is an increasing public demand for protection from such hazards, there is currently no coherent, effective public policy for technological hazard management. Recognizing the need for a generic approach that goes beyond the current case-by-case response to hazards, the research objectives of this study are: (1) to formulate a taxonomy of technological hazards; (2) to use this taxonomy to suggest means for improving public policy and governmental decisionmaking; (3) to identify generic obstacles preventing timely and effective governmental decisionmaking to control or mitigate technological hazards; (4) to develop a conceptual framework for auditing the effectiveness of hazard management; (5) to extend previous research on risk perception and to relate this work to the process of risk decisionmaking; (6) to construct an initial, comprehensive theory of hazard management; and (7) to develop methods for improved communication of information relating to hazards and risk. It is expected that private and government decisionmakers will use the results of the study to improve hazard management policies and to better understand and predict public response to various hazards.

********** 619 **********

Institution:	University of Maryland Center for Philosophy and Public Policy College Park, Maryland 20742
Principal Investigator/ Author:	Douglas MacLean
Title:	Risk and Consent: Three Conceptual Models
Project Status:	Active

Abstract:

A basic policy question in risk analysis is whether a product or technology is acceptably safe. In seeking an answer to this question, it is necessary to examine those social processes that lead to consensus. The overall objective of this project is to address this issue through a critical analysis of the normative and ethical assumptions underlying methodological studies of risk. Specific objectives are (1) to prepare an initial survey of normative, ethical, and epistemological issues in risk analysis; (2) to examine three explicit models of consent for making decisions about risk and safety; (3) to develop a philosophical theory of risk and consent in centralized decisionmaking contexts; and (4) to apply the theory in at least one important policy area. During the course of the project, interdisciplinary working groups will be convened to discuss conclusions. It is expected that the results of the study will be useful to researchers and policymakers.

********** 620 **********

Institution:	Midwest Research Institute 425 Volker Boulevard Kansas City, Missouri 64110
Principal Investigator/ Author:	Edward W. Lawless
Title:	The Assessment of Comparative Methodologies for Comparing the Risks of Selected Technologies
Project Status:	Active

Abstract:

One of the most critical problems faced by decisionmakers and analysts is how to compare and balance the risks, costs, and benefits of alternative science and technology policies. The overall purpose of this study is to develop a methodological framework for evaluating the comparative risks of alternative technological solutions to such national concerns as energy, materials, environmental quality, food, and drugs. Specific objectives of the study are (1) to define and classify comparative risk assessment methods; (2) to review and evaluate past applications of comparative risk assessment methods; (3) to evaluate the usefulness of different risk assessment techniques for comparative risk assessment; (4) to analyze the institutional constraints associated with the use of comparative risk assessment in science and technology decisionmaking; (5) to synthesize the findings and results of earlier tasks into a cohesive set of comparative risk assessment principles and methods; and (6) to refine the findings and conclusions by applying the principles and methods to a diverse set of technologies. It is expected that the results and conclusions of the study will be useful to science and technology researchers and policymakers.

********** 621 **********

Institution: University of Southern California
Social Science Research Institute
University Park
Los Angeles, California 90007

Principal Investigator/
Author: Ward Edwards
Detlof Von Winterfeldt

Title: Toward Developing Methods for Understanding Public Responses to Risky Technologies

Project Status: Active

Abstract:

The primary purpose of the study is to develop better methods for understanding public responses to risky technologies. The study will provide a preliminary indication, based on empirical data, about whether disagreements about the acceptability of risky technologies can be explained simply in terms of disagreements concerning the facts about the risks and benefits associated with them, or whether additional factors, such as differences concerning how risks and benefits should be defined, the types of trade-offs that should be made between risk and benefits, or the basic social values relevant to such decisions, must also be taken into account. In order to address this issue, a conceptual framework for analyzing the causes for people's judgments about the acceptability of risky technologies will be developed and tested experimentally, adapting and using techniques from decision analysis. The overall objective of the study is to take a step toward providing policymakers with better tools for understanding, analyzing, and anticipating public responses to new and developing risky technologies.

********** 622 **********

Institution: Woodward-Clyde Associates
Environmental Systems Division
Three Embarcadero Center, Suite 700
San Francisco, California 94111

Principal Investigator/
Author: Ralph L. Keeney

Title: Risk Evaluation and Policy

Project Status: Active

Abstract:

The primary purpose of this study is to develop general methods that can be used to help evaluate the acceptability of risks to public health and safety. Development of these methods will be based upon an approach that involves asking individuals to think systematically about the value issues involved in making decisions about public risks. Important factors of the problem, such as the total number of potential fatalities, the potential for catastrophe, and so forth, are first identified. During the study, individuals with experience in policies about public risks will help identify factors that have been important in previous public policy decisions. Value judgments about acceptable levels of each factor, the relative importance of each, will then be carefully translated by an analyst into more precise, mathematical terms. The methods developed by the research effort will be used to examine previous and current public policies concerning risks in order to (a) understand better the ethical and value assumptions underlying them and (b) assess the internal logic and consistency of such policies. In addition to developing general methods, it is anticipated that the study will contribute to a better understanding of the types of value issues involved in decisions about the acceptability of risk.

********** 623 **********

Institution: Yale University
Roper Center Office for Teaching and Research and The Institution for Social and Policy Studies
New Haven, Connecticut 06520

Principal Investigator/
Author: Jan A.J. Stolwijk
D. R. DeLuca

Title: Public Perceptions of Technological Risks: A Methodological Study

Project Status: Active

Abstract:

This research project is a methodological study that will examine the risk perceptions of those who have and have not been active in the risk management process. In the conduct of the study, methodological issues related to two questions will be addressed: Is it possible to infer the risk perceptions of the general population from the risk perceptions of specialized interest groups in the population? Do different sections of the public evaluate the acceptability of technological risk in different ways and by different criteria? The analysis will be based on regional samples of the general public and of individuals who have been active in the risk management process. In the conduct of the study, special attention will be paid to factors that affect public acceptability of technology, including demographic characteristics, attitudes toward technology, and access to information. It is expected that the study will lay the methodological foundation for research aimed at providing information to decisionmakers who must make policy decisions about how to manage risks within a democratic society.

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